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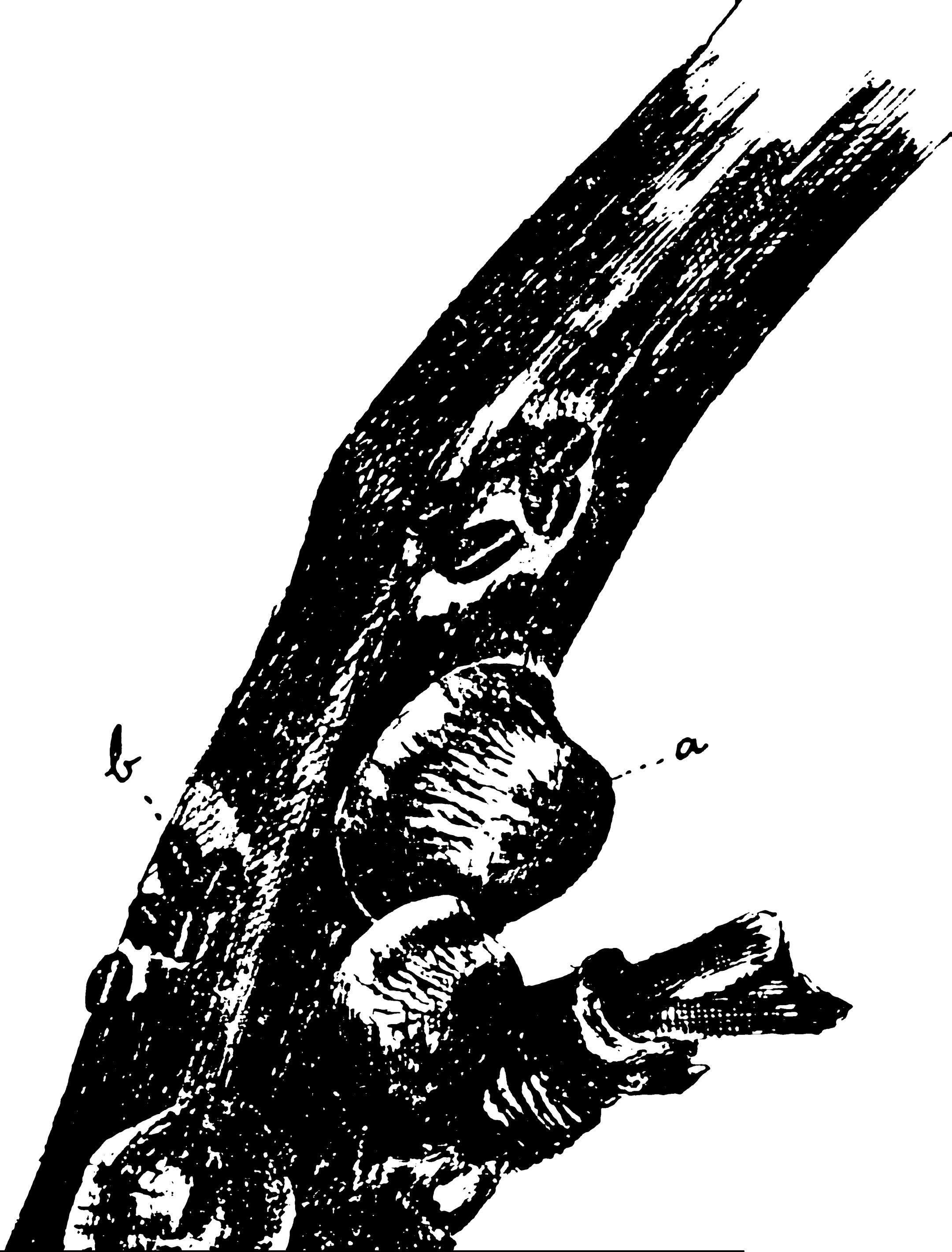

Annual report

Entomological Society of Ontario, Ontario Dept. of
Agriculture, Ontario Legislative Assembly

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THIRTY-EIGHTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO

1907

PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.

PRINTED BY ORDER OF
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1908

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To the Honourable SIR WILLIAM MORTIMER CLARK, K.C.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Entomological Society for 1907.

Respectfully submitted,

NELSON MONTEITH,

Minister of Agriculture.

Toronto, 1908.

232730

CONTENTS.

PAGE
LETTER OF TRANSMISSION 5
OFFICERS FOR 1907-1908 6
LIST OF CANADIAN MEMBERS 7
ANNUAL MEETING 9
  The Entomological Outlook (Annual Address of the President): Dr. James Fletcher 9
  Conference on Fruit-tree Insects 15
  Reports on Insects of the year.—Division No. 1, C. H. Young 22
  " " Division No. 2, C. E. Grant 23
  " " Division No. 3, J. B. Williams 24
  " " Division No. 4, C. W. Nash 24
  " " Division No. 6, J. A. Balkwill 26
  The Gypsy and Brown-tail Moths in Massachusetts: A. H. Kirkland 27
  Voices of the Night: Dr. T. W. Fyles 31
  Report of the Council 35
  " Montreal Branch 37
  " Quebec Branch 38
  " Toronto Branch 39
  " Treasurer and Auditors 40
  " Librarian 40
  " Curator 40
  " Delegate to the Royal Society 41
  Collecting and Rearing Dragon-flies at the Georgian Bay Biological Station: Dr. E. M. Walker 43
  Preliminary List of the Scale Insects of Ontario: T. D. Jarvis 50
  The Lime-Sulphur Wash: L. Caesar 72
  An unusual outbreak of Halisidota Caterpillars: A. Gibson 82
  Additional Insect Galls of Ontario: T. D. Jarvis 85
  Injurious Insects in Ontario in 1907: C. J. S. Bethune 95
  Remarkable outbreak of the Variegated Cutworm: C. J. S. Bethune 99
  Two-winged Flies: Dr. T. W. Fyles 102
  Summer Meeting of the Entomological Society of Ontario 112
  Entomological Record: Dr. James Fletcher and A. Gibson 113

UNIV. OF CALIFORNIA

THIRTY-EIGHTH ANNUAL REPORT

OF THE

Entomological Society of Ontario,

1907.

To the Honourable Nelson Monteith, Minister of Agriculture:

SIR,—I have the honour to present herewith the Thirty-eighth Annual Report of the Entomological Society of Ontario, which contains the proceedings of the Forty-fourth Annual Meeting of the Society. A full account is given of the discussions upon fruit-tree insects that took place, the papers that were read and the reports of the various Officers, and Branches of the Society. Since the removal of its headquarters to Guelph and its more intimate connection with the Ontario Agricultural College, its activities have been increased and its work carried on with much enthusiasm and success.

The Canadian Entomologist, the monthly magazine of the Society, has been regularly issued during the year and has now completed its thirty-ninth annual volume. Its high scientific character has been steadily maintained.

I have the honour to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,
Editor.

Ontario Agricultural College,
Guelph.

Entomological Society of Ontario.

OFFICERS FOR 1907-1908.

President—James Fletcher, LL.D., F. R. S. C., F. L. S., Entomologist and Botanist of the Experimental Farms, Ottawa.

Vice-President—Tennyson D. Jarvis, B. S. A., Lecturer in Entomology and Zoology, Ontario Agricultural College, Guelph.

Secretary—Lawson Caesar, B.A., O. A. College, Guelph.

Treasurer—S. B. McCready, B.A., Professor of Botany and Nature Study, O. A. College, and Macdonald Institute, Guelph.

Librarian—Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Professor of Entomology and Zoology, O. A. College, Guelph.

Curator—J. Eaton Howitt, B.S.A., Lecturer in Botany, O. A. College, Guelph.

Directors—Division No. 1—C. H. Young, Ottawa.
Division No. 2—C. E. Grant, Orillia.
Division No. 3—J. B. Williams, Toronto.
Division No. 4—C. W. Nash, Toronto.
Division No. 5—George E. Fisher, Burlington.
Division No. 6—J. A. Balkwill, London.

Directors—(Ex-Presidents of the Society)—Professor Wm. Saunders, C. M. G., LL.D., F.R.S.C., F.L.S., Director of the Experimental Farms of the Dominion, Ottawa; Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Guelph; W. Hague Harrington, F.R.S.C., Ottawa; Professor John Dearness, Vice-Principal Normal School, London; Henry H. Lyman, M.A., F.E.S., F.R.G.S., Montreal; Rev. T. W. Fyles, D.C.L., F.L.S., Levis, P.Q.; Professor Wm. Lochhead, B. A., M. S., Macdonald College, Ste. Anne de Bellevue, P.Q.; John D. Evans, C.E.. Chief Engineer, Central Ontario Railway, Trenton.

Auditors—B. Barlow, B.S., and J. W. Crow, B.S.A., Ontario Agricultural College, Guelph.

Editor of the "Canadian Entomologist"—Rev. Prof. Bethune, Guelph.

Editing Committee—Dr. Fletcher, Ottawa; H. H. Lyman, Montreal; J. D. Evans, Trenton; Prof. Lochhead, Macdonald College, P. Q.; G. E. Fisher, Burlington, J. B. Williams, and C. W. Nash, Toronto.

Delegate to the Royal Society—Arthur Gibson, Ottawa.

LIST OF CANADIAN MEMBERS OF THE ENTOMOLOGICAL SOCIETY.

PROVINCE OF ONTARIO.

Abbott, Dr. A. R.	Toronto.
Albright, W. D.	London.
Baker, A. C.	"
Balkwill, J. A.	"
Barlow, B., O. A. C.	Guelph.
Bethune, Prof., C.J.S., O.A.C.	"
Binnie, T. H., O.A.C.	"
Black, Davidson	Toronto.
Blackmore, Miss E.	"
Bock, H. P.	London.
Bond, G.	Guelph.
Bowman, J. H.	London.
Brodie, Dr.	Toronto.
Brown, Walter	"
Butt, W.	Oakville.
Caesar, L., O. A. C.	Guelph.
Calvert, J. F.	Orangeville.
Coleman, R. E.	Toronto.
Collingwood, J. H.	Kintore.
Cornish, G. A.	Orillia.
Cosens, A.	Toronto.
Creelman, Pres't, O. A. C.	Guelph.
Dearness, Prof. J.	London.
Dunlop, James	Woodstock.
Edmunds, Brodie	Toronto.
Elliott, W. H.	"
Evans, J. D.	Trenton
Fisher, George E.	Freeman.
Fletcher, Dr. James	Ottawa.
Fraser, W. J.	Toronto.
Frier, G. M., O. A. C.	Guelph.
Gibson, Arthur	Ottawa.
Grant, C. E.	Orillia.
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Hahn, Paul	Toronto.
Haight, D. H.	Sudbury.
Hallam, M.	Toronto.
Hallam, R.	"
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Harrington, W. H.	Ottawa.
Howitt, J. E., O. A. C.	Guelph.
Ivy, M.	Toronto.
Jarvis, T. D. O. A. C.	Guelph.
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Jones, D., O. A. C.	Guelph.
Kilman, A. H.	Ridgeway.
King, R. W.	Toronto.
Law. John	London.
Lawrence, C. A., O. A. C.	Guelph.
Lawson, F.	London.
Maughan, J., Jr.	Toronto.
McCready, Prof. S. B., O. A. C.	Guelph.
McRitchie, A. R.	Kincardine.
Merchant, Principal, F. W.	London.
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Nash, C. W.	"
Painter, A. J., O.A.C.	Guelph.
Readwin, R.	"
Richard, A. E.	Ottawa.
Ritchie, A. R.	Kincardine.
Rossitor, George	Toronto.
Saunders, H. S.	"
Saunders, W. E.	London.
Silcox, Sidney	St. Thomas.
Slater, A. E., O.A.C.	Guelph.
Smith, A.	Renfrew.
Smith, Walter	London.
Stewart, J.	London.
Stuart, F. A.	"
Tanton, John	Uxbridge.
Thompson, W. Robin, O.A.C.	Guelph
Treherne, R. C., O. A. C.	"
Walker, Dr. E. M.	Toronto
Watson, Dr. A. H. R.	Port Hope.
Webb, J. H.	Toronto.
Wheaton, R. R., O.A.C.	Guelph.
White, James	Snelgrove.
Williams, J. B.	Toronto.
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Wood, S. T.	Toronto.
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Young, C. H.	Ottawa.
Zavitz, E. J., O. A. C.	Guelph.

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Boulton, Mrs	"
Bowen, Miss	"
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Brainerd, H.	"
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Chagnon, Gustave	Montreal.
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Denny, E.	"
Dunlop, G. C.	"
Elliott, W. R.	Sherbrooke.
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Faulconer, Miss Clare	"
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Freeman, Miss I. H.	Quebec.
Fyles, H.	Levis.
Fyles, Miss W.	"
Fyles, Mrs	"
Fyles, Rev. Dr. T. W.	"
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Geggie, Miss Lois	"
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Griffin, A.	"
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Hedge, Miss Louisa	"
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Johnston, Miss M. G.	Levis.
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Lindsay, Col. Crawford	Quebec
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Norris, A. E.	Montreal.
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Simmons, J. H.	"
Simmons, Mrs. J. H.	"
Southee, G. R.	Outremont.
Swaine, J. M.	Ste. Anne de Bellevue.

Tourchot, A. L	St. Hyacinthe
Turnbull, Lt.-Col. F	Quebec.
Turner, Hon. Richard	“
Turner, Mrs. R	“
Wade, Miss	New Liverpool.
Weir, Douglas	Montreal.
Winfield, Mrs	Quebec.
Winn, A. F	Montreal.
Wood, Rev. Edmund	“

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Dod, F. H. Wolley	Millarville.

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Abercrombie, Miss Ivy	Vancouver.
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Anderson, J. R	Victoria.
Armstrong, E. W	Salmon Arm.
Bryant, T	Vancouver.
Bush, A. H	“
Cockle, J. W	Kalso.
Danby, W. H	Rossland.
Dashwood-Jones, W. A	New Westminster.
Day, G. O	Duncan's Stn.
Draper, R	Vancouver.
English T. M	Cowichan Stn.
Findlay, Rev. G. H	Fort Steele.
Foster, F	Vancouver.
rassham, R. T	Keithly Cr'k
Hanham, A. W	Duncan's Stn.
Harvey, R. V	Vancouver.
Keen, Rev. J. H	Metlakatla.
Livingston, C	Duncan's Stn.
Luscombe, P	Cowichan Bay.
Marmont, L. E	Vancouver.
Marrion, H	Vancouver.
Reed, E. Baynes	Victoria.
Sherman, R. S	Vancouver.
Skinner, E. M	Duncan's Stn.
Taylor, Rev. G. W	Wellington.
Towler, J	Vancouver.
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Venables, E. P	Vernon.
Wilmot, E. S	“
Wilson, T	Vancouver.

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Criddell, Norman	Aweme.
Dennis, A. J	Miniota.
Heath, E. F	Cartwright.
Wallis, J. B	Winnipeg.

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Mackay, Dr. A. H	Halifax.
Russell, John	Digby.

SASKATCHEWAN.

Croker, A. J	Redvers.
Willing, T. N	Regina.

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Cockerell, Prof. T. D. A	Boulder, Col.
Cresson, Ezra T	Philadelphia Pa.
Edwards, William H	Coalburgh, W. Va.
Howard, Dr. L. O	Washington, D. C.
Scudder, Dr. S. H	Cambridge, Mass.
Smith, Prof. J. B	New Brunswick, N. J.
Uhler, P. R	Baltimore, Md.
Webster, F. M	Washington, D.C.
Wickham, Prof. H. F	Iowa City, Iowa.

LIFE MEMBER.

Saunders, Dr. William	Ottawa.

Director of the Experimental
Farms of the Dominion.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The forty-fourth annual meeting of the Society was held in the Biological Building of the Ontario Agricultural College, Guelph, on Thursday, October 31st, and Friday November 1st. The chair was taken by the President, Dr. James Fletcher, Entomologist and Botanist of the Dominion Experimental Farms. Among those present were Rev. Dr. Fyles, Levis, P.Q.; Mr. Henry H. Lyman, Montreal; Mr. Arthur Gibson, Central Experimental Farm, and Mr. C. H. Young, Ottawa; Dr. Brodie, Dr. E. M. Walker, Mr. J. B. Williams and Mr. C. W. Nash, Toronto; Mr. J. F. Calvert, Orangeville; Professors Hutt, McCready and Bethune, Messrs. Jarvis. Eastham. Howitt, Zavitz, Crow, Klinck, and a number of students of the Ontario Agricultural College; Mr. Howes, Principal of the Consolidated School, Mr. Graesser and others, Guelph.

Letters expressing regret at their inability to be present were received from Mr. C. C. James, Deputy Minister of Agriculture for Ontario; Mr. W. H. Harrington, Ottawa; Mr. G. E. Fisher, Burlington; Prof. Dearness and Messrs. W. E. Saunders and J. A. Balkwill, London; Mr. J. Fred. Smith, San Jose Scale Inspector for Ontario; Mr. Walter James Brown, Editor of the *Weekly Globe and Canada Farmer*, Toronto; Mr. A. McNeill, Chief of the Fruit Division, Department of Agriculture, Ottawa; Mr. P. W. Hodgetts, Secretary of the Fruit Growers' Association, and others.

THE ENTOMOLOGICAL OUTLOOK.

[*The Annual Address of the President.*]

BY DR. JAMES FLETCHER, DOMINION ENTOMOLOGIST, OTTAWA.

Ladies and Gentlemen: It is with feelings of pleasure and pride that I welcome you and invite all present to take part in the Forty-fourth Annual Meeting of the Entomological Society of Ontario. During its long and useful life, this organization through its efficient officers, has made a constant and consistent endeavour to render its efforts not only useful to the Province in which it has held an official position as an intregal part of the Department of Agriculture, but also effective in advancing the scientific development of the science of entomology. Under the patronage and with the expressed sympathy and encouragement of the Minister of Agriculture and our highly esteemed Deputy Minister of Agriculture, our society has from the beginning until the present time continued to grow in usefulness and public appreciation among those for whom our efforts have been made. It is not now necessary to draw attention individually to the many stalwart men who have served on the councils, everyone of whom has been of great value to the society in adding to its stability, dignity, and usefulness; in building up its reference collections and magnificent library; in solving the various problems which have arisen with the sudden appearance in destructive numbers of many injurious insect pests; and also in presenting to the public in its publications, the *Canadian Entomologist* and the Annual Reports, a vast amount of valuable knowledge, by which science has been enriched and enormous sums of money have been saved to Canada at a disaproportionately small expenditure. All of this has been done at the cost of much self sacrifice, but quietly and without ostentation. In this good work, this great work, there are, however, two names which I cannot refrain from mentioning, William Saunders and Charles J. S. Bethune. These two men to whom we owe so much, were associated together in founding the society, and from that time to the present day have been, with their energy, patience, discretion and unfailing courtesy, main stays of its progress and healthy growth. Without undue glorification, it is well that our members should recollect the long period over which this work of unbroken activity has extended; and it behoves us to see well to it that, as members of such a worthy society, our very best efforts are put forth in all the work we do, to take the fullest advantage of the greater facilities we enjoy to-day over those who have preceded us in our chosen field. Let us never forget the debt we owe to the pioneers of science. The results of the dearly bought experience of the past form a solid foundation of fact upon which we now stand firmly and confidently, to enter upon new fields of investigation. The status of entomological research to-day is far different from what it was even ten years ago. The number of devotees to these attractive studies is easily a hundredfold greater than then. The same may be said of almost every aspect of the case:—the available works of reference, the greater facilities and decreased cost of communicating with others, of local or distant travel, and, above all, the spirit of helpfulness to others less informed than themselves, so conspicuously exhibited by specialists in every branch of scientific study.

We in Canada can never over-estimate what we owe to the generosity and ever-ready assistance of the eminent fellow-workers in the great republic to the south of our borders, who have made America the chief fountain head and acknowledged centre of applied entomolgy. The names of such men as Riley, Walsh, Lintner, Howard, Comstock, Forbes, Webster, Smith, Marlatt, Felt and a host of others too numerous to mention, are known and honoured the whole world over, but nowhere more sincerely than in Canada, where we owe so much to them. As we all know, it is very seldom that an outbreak of any serious pest occurs in any part of the Dominion, but we can at once by consulting the writings of these men, learn all that is known of the habits of the insect and what the experience of many students has shown to be the best means of dealing with it. In entomolgy, at any rate, whether purely scientific or applied to the industries of the nation, there is no recognition of international boundary lines, unless perhaps it may be as an excuse for extending exceptional courtesies. Canadians are welcomed as freely at all the great conferences in the United States and have as full privileges of membership open to them as though they were freeborn citizens of the Union. At the recent organization of the Entomological Society of America, the most important entomological society in the world, two of the officers of this society were elected as original fellows and placed on the council, one of them being made a Vice-President. Since then two more members of our Council have been elected to fellowships, a highly coveted honour.

On the other hand, I need not remind you of the inspiring visits and addresses we have been favoured with at our recent annual meetings by Dr. Howard, Prof. Webster, Dr. Smith, Prof. Wickham, Dr. Skinner and our honoured guest of the present meeting, Mr. A. H. Kirkland, who will explain to us the remarkable work which is being carried on under his superintendence against the Gypsy and Browntail moths in the State of Massachusetts.

It has long been a matter of surprise, even more than that, of amazement, to those who understand the enormous losses caused by insects to every class of vegetable products, that the study which deals with these powerful enemies and from which all remedies must emanate, should be so lightly esteemed by the general public. That this—may we call it, age of darkness and ignorance?—is now passing away, is evidenced by the important international investigations which are being carried on by Governments in all parts of the world at apparently enormous expenditure. I say "apparently," because the good results obtained so far outweigh in magnitude all the cost of securing them, that this latter must be considered trifling by comparison. One needs but to think of the immense saving which has been effected in checking or controlling some of the better known extensive invasions of insects. The prompt application of practical remedies could only be made where scientific investigations both of the life-histories and of the most appropriate remedies had already cleared the way and had pointed out what must be the road to success.

The large expenditures authorized by Governments from time to time for the purpose of investigating the habits of, and fighting against, injurious insects, have to some measure opened the eyes of the world to the important role played by insects as affecting the general welfare, and the necessity of dealing with them promptly and vigorously. Grasshopper invasions have in the past caused widespread devastation of fertile lands; but, with a knowledge of the egg-laying habits and with modified agricultural treatment of the land based on this knowledge, such losses can be to a large measure controlled. The San José Scale, although confined to only one comparatively small area in Ontario, and to two isolated points in British Columbia, has been the cause of considerable loss in the orchards of the Niagara Peninsula and also of much anxiety to Governments and fruit growers of the whole Dominion. From the vast amount of experimental work of many students here and in the United States, a practical remedy has been discovered in the lime-sulphur wash. The San José Scale has called for the voting of large sums of money in Canada and in almost every State of the Union; and, although, as stated, a practical remedy has now been found, it is probable that for all time fruit growers, in those districts where that insect thrives, will every year have to take steps to control it. This, however, it must be remembered, is not because the remedy is not all-sufficient, but, because, even against this well understood and justly dreaded enemy, so many fruit growers do not take the necessary steps or even ordinary precautions to control it. Perhaps the best known and most convincing instance of a large expenditure of this nature, is that for the campaign which has been waged against the Gypsy and Browntail moths in the State of Massachusetts. Up to the year 1900 a great deal of money had been spent against the former of these, and it had been almost vanquished, when, for political reasons, the appropriations were most unfortunately stopped. This was, it can now be seen, a most deplorable mistake; for during the following five years nothing was done, and the whole of the area previously infested was again overrun and fresh territory was invaded. The necessary appropriations up to the present time have now reached the sum of about two million dollars, and the Federal Government has had to step in and help. Although wonders have been achieved by Mr. Kirkland and his associates, the end is by no means in sight. The thorough work done by Mr. Kirkland and Dr. Howard in connection with the introduction of parasites from Europe are an object lesson to the whole scientific world.

Dr. Howard, when speaking as president of the section of Economic Zoology, at the great international Congress of Zoologists held at Boston in August last, referred to this work in the New England States as being the most extensive campaign in economic entomology that the world has ever seen. He commended most highly the practical and efficient way in which it had been conducted, justly giving credit to Mr. Kirkland for his great executive ability and discretion in dealing successfully with a most difficult problem.

Another campaign calling for enormous sums of money and the greatest scientific skill, on the part of those engaged in the warfare, was made necessary by the spread of the Cotton Boll Weevil from Mexico into the United States. The extent of the damage done by this insect can hardly be believed by those who have not studied the matter; but in some seasons of great abundance the loss in a single year has been estimated at twenty-five millions of dollars, and it is said that the weevil is gradually spreading farther through the Southern States every year.

The Hessian Fly, the Wheat Midge, the Chinch Bug, and recently the Grain Aphis have all been the cause of great losses to the countries where they have occurred; but it is now generally recognized that, with these insects, as with nearly all others, farmers, fruit growers and gardeners can get from expert students of insect life useful information as to improved agricultural methods and as to tested remedies, by which much of the loss may be prevented. The publication of popular reports by provincial, state and federal governments has familiarized many with the appearance of their worst insect enemies; and the introduction of the so-called Nature Study into schools has taught a large number of the fathers and mothers of school boys and girls throughout the country, as well as the scholars themselves, that it is worth the while of every one to know something about the common insects which they see about them every day.

Characters which among others render insects particularly useful in Nature Study and in the higher exercises of animal biology, are, the large numbers of common species which are always accessible; their convenient size; the ease with which many kinds can be kept alive and reared in confinement to almost any required number, so that their habits can be studied under varying conditions; and the general similarity of a large number of specimens of a given species, and yet, at the same time, the wide range of certain features of variation within the limits of a single species. One of the greatest drawbacks to the use of insects, particularly in a school where there is no regular museum, is the perishable nature of specimens, if it should be desirable to preserve them. This, however; takes them out of the proper field of Nature Study, into natural history pure and simple, where provision must be made for the preservation of specimens so that they may be available whenever required for study and comparison.

The remarkable discoveries which signalized the close of the last century, as to the conveyance of many diseases through the medium of common insects, *e.g.*, malaria, yellow fever, typhoid, the bubonic plague and other diseases of mankind, and also of Texas fever and other diseases of domestic animals, have opened up another field of useful investigation which has inseparably linked together entomology and medical science.

During the past summer subsequent to our summer meeting, I had the privilege of travelling through our Northwestern Provinces with Dr. Henry

Skinner and listening to a series of lectures given by him upon the transmission of disease by insects. These lectures evoked the keenest interest from the large audiences who heard them, and there were many expressions of surprise at the intimate relation which was shown between the prevalence of some diseases and the occurrence of such common insects as house flies, fever mosquitoes, bed bugs, fleas, ticks, etc.

In this connection we, as Canadians, must read with great pride the accounts of the excellent work which is being done by Dr. Todd, of Victoria, B.C., and Dr. Allan Kinghorn, of Toronto, in connection with the School of Tropical Medicine, at Liverpool, England. The last named is now in Africa, on an expedition to the Zambesi, having been specially selected to investigate the fatal sleeping sickness and allied diseases, which are conveyed by insects. No less noteworthy are the investigations of animal diseases, which are being carried on by Drs. Higgins, Hadwen and Watson, under Dr. Rutherford, the Veterinary Inspector General of the Dominion.

From a consideration of the facts above cited I cannot but feel that the outlook for entomology and for entomologists is brighter than it has been for many years. The study of insects is now recognized as a useful branch of knowledge which affects materially the prosperity, comfort and health of mankind. This is attested by its introduction into the curricula of many colleges and schools and the appointment of Professors to instruct those who desire to learn about insects.

In Canada we have many good workers connected with our Society, or working alone, who are year by year adding to the mass of scientific knowledge concerning Canadian insects. This knowledge is increasing rapidly and is being placed on record for future use. Our society contains in its membership a large number of enthusiasts, and I am pleased to know that the publication of the annual Entomological Record in our reports has to some measure fulfilled its designed object, in encouraging and bringing into communication with each other and with specialists, many scattered workers in distant parts of Canada, who, by learning what others were doing, were enabled to be mutually helpful to each other.

As indisputable evidence of the value of this knowledge, it was pointed out by the Editor of the *Canadian Entomologist* in the issue for May last, that the Government of the United States, (of perhaps the most practical people in the world) passed appropriations for entomological purposes for the fiscal year ending June 30th, 1908, of upwards of $650,000, made up as follows:

For Bureau of Entomology, Washington	$136,000 00
Emergency appropriations:	
Cotton Boll Weevil investigations	190,000 00
Prevention of spread of Gypsy and Brown-tail Moths..	150,000 00
Eradication of Cattle Ticks	150,000 00
	$626,000 00

and, in addition to this, part of another appropriation of $250,000 for the National Museum is devoted to the care of the insect collections, in which work several officers are permanently employed. A proportion of another vote is used for the printing of bulletins, special reports, etc. These objects will certainly take at least another $24,000, making a gross amount of about $650,000, appropriated in a single year to study and fight insects.

Now, this large expenditure is only justifiable because it is believed that commensurate benefits are received in return. This brings me to the last part of my subject, which I think is of keen personal interest to many present here to-day. If any of you, and doubtless there are some, think of making a serious study of entomology, that is to take it up as your life's work, there are several things which must be considered very carefully. The first, undoubtedly, is, Are you so keenly interested in the work as to enable you to excel? This is no easy matter. In the first stage of study, everything examined is strange, attractive and interesting; but then comes a long stage of close patient study and hard work, which love for the subject alone can carry you through. After this comes the reward in the shape of the delight of making new discoveries and learning more and more of the underlying principles of the science in all its branches, so that, when occasion arises, you may be able to take advantage of favourable opportunities for securing remunerative work. Moderate attainments are of little value in making a living. To be successful you must be, at any rate, just a little better than your fellows. Success must always depend on excellence; and, to attain this, thoughtful consideration and methodical application are as necessary as patience and hard work. All work undertaken should be done as well as possible, for your own sakes and for the work's sake. I believe it should be a principle with everybody never to strive for what is called "credit". Credit can never be gained by direct attack or by self-advertising. Fame which is the same thing, is a fickle godess who comes unsought and, if dragged in against her will, is in such a sulky mood that she is not worth having. Good thorough work will always demand and will always receive recognition. Strive to have your work as perfect in every detail and as conclusive as you can render it; and, above all things, aim to avoid the rocks and whirlpools of unproved theory.

Owing to the rapid development of economic entomology, new openings are being constantly created; and, as a consequence, there will be keen competition among the whole army of young men now training themselves to compete for these prizes. I know that there are openings to-day for well-grounded and mentally well-equipped entomologists. The demand for such men is increasing, and in the near future there will be further opportunities in many lines of work which to-day are not dreamed of. The best prepared will naturally gain the greatest prizes. The one desideratum is efficiency. A knowledge of insects alone is not sufficient to make an efficient practical entomologist. There are many necessary factors for such an official; for instance, he must be an enthusiast and should not only possess a general knowledge of all the different order of insects, but should have a special knowledge of some one or more; he should be well grounded in the elements of animal life and plant life and must have at least a working knowledge of the first principles of agriculture and horticulture, besides being fairly familiar with the botany of the locality where he does most of his work. A good knowledge of the English language is also most essential, so as to acquire a habit of expressing simply and clearly but in a succinct manner whatever information it may be necessary to communicate to the public.

Those of you who are in attendance at this well organized College, have special advantages of an exceptional nature, of which you should use every endeavour to avail yourselves to the fullest possible extent. You have Professors thoroughly qualified and eminent in their own subjects. In your Professor of Entomology especially, you have a man who perhaps has done more in Canada than anyone else to build up and establish on a firm basis the science which we have met here to-day to discuss, a man who, so capable in teaching, is also so genial and courteous that it is always a pleasure to meet him and a delight to be associated with him. You have around you extensive and beautiful grounds in which you can study insects and the plants with which they are associated, as well as birds and other members of the animal kingdom. You have a comfortable, convenient and well equipped museum, and also the use of the extensive collections and valuable library of our Society. With such opportunities what should you not achieve? The College you are attending, is in many ways the very best of its kind in America or in the world. Think of this and remember it. It is an easy matter for the men gathered together under its shadow to honour their alma mater. May it be always their highest ambition to honour her and to be an honour to her.

CONFERENCE ON FRUIT-TREE INSECTS.

The main pests discussed were the Fruit-tree Bark Beetle or Shot-hole Borer, the Codling-worm, the Oyster-shell Scale and the Woolly Aphis.

Mr. L. Caesar, of the Ontario Agricultural College, opened the discussion on the first named insect by relating some observations he had made on its ravages in the Niagara district. His account was as follows:

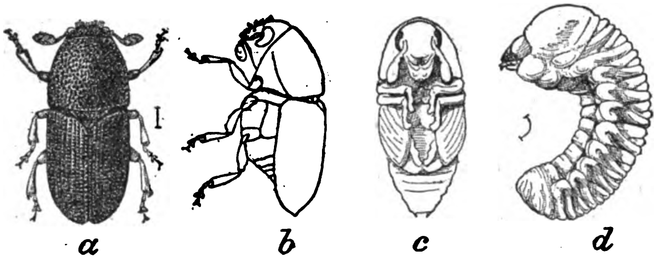

Fig. 1.—*Scolytus rugulosus*: *a*, adult beetle; *b*, same in profile; *c*, pupa; *d*, larva—all magnified about 10 times. (U. S. Dep't. of Agriculture).

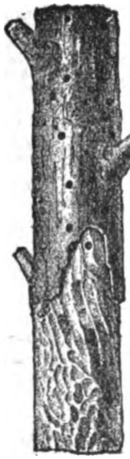

Fig. 2.—Work of *Scolytus rugulosus* in twig of apple—natural size. (U. S. Dep't. of Agriculture).

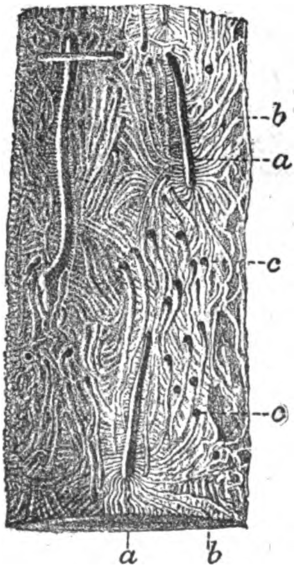

Fig. 3.—Galleries of *Scolytus rugulosus* on twig under bark; *a*, *a*, main galleries; *b*, *b*, side or larval galleries; *c*, *c*, pupal cells—natural size—(after Ratzeburg, from U. S. Dep't. of Agriculture).

THE FRUIT TREE BARK BEETLE (*Scolytus rugulosus*).

In August last (1907), while acting as assistant entomologist in the temporary absence of Dr. Bethune and Mr. Jarvis, I received a letter from Mr. Geo. Olmstead, of Grimsby, asking whether I knew of a blight that attacked cherry trees. In response to a request for samples of the affected leaves and twigs, Mr. Olmstead sent me as many as he could put in a large envelope. These were examined for fungus diseases and some were also sent to the Bacteriological Department to be tested for bacteria. No fungus or bacteria were discovered to be present. Accordingly I wrote to Mr. Olmstead and told him that I should be making a tour of the Niagara district in a few weeks to investigate the results of the lime-sulphur wash, and would call and try to discover what was the cause of the injury to his cherry trees.

On September 23rd, I went to Fruitland and in the course of my regular investigations visited many prominent fruit-growers. I asked each of these whether any of their cherry trees had shown any signs of disease. Most of them said that they had observed the leaves of some at least of their trees withering up and dying, but did not know why. On investigation we found that the trees that had been healthy last year and the early part of this year, but that were now dying, were thickly dotted in most cases with gummy exudations, varying from the size of a pea to half an inch or more in diameter. On removing the gum from a number of these places we found clear evidence that some insect had bored a tiny hole through the bark in each case and that it was from these wounds that the gum had exuded. On further investigation we found a number of the insects themselves. These I identified as Fruit-tree Bark-beetles (*Scolytus rugulosus*), Fig. 1. They were about one-tenth of an inch in length, and about one-third that amount in width, were nearly cylindrical in shape and black in color.

A number of orchards were visited in the following localities: Fruitland, Winona, Grimsby, Jordan, Vineland, and St. Catharines. In nearly all of these the beetles were found attacking not only dead and diseased trees, but also trees that had been perfectly healthy hitherto. In some orchards nearly half of the cherry trees were severely attacked, in others only a very few trees.

The attacks were not confined to any one variety of cherry tree, for both sweet and sour varieties were assailed. In one orchard, however, where Montmorency and Richmond trees were side by side, the Richmonds were much injured while the Montmorencies were left untouched

The only other tree besides the cherry on which I found the beetles were a few plum trees in the St. Catharine's district. Two of these especially were very badly covered with gum and were practically past recovery.

On examination of the habits of the beetle, it was found that they seemed in most cases to have attacked the dead or weak trees first and to have spread from these to the healthy ones. This, I find, is in accordance with the regular accounts given by different writers on the subject. In their attack upon healthy trees the beetles did not confine themselves to any set order of procedure but apparently were just as likely to assail twigs or small branches as the trunk.

On the trees where the gummy exudations were, I examined a number of the holes from which the gum had exuded, expecting to find larvæ present, but in no case did I find any. It looked as if the attacks were made with the intention of causing the tree to die and thus become a proper place for egg laying. Larvæ, however, were found in considerable numbers under the bark of dead trees. The surface of the wood in such cases, when the bark had been removed, was engraved with numerous little channels running in different directions but not going deep into the sap-wood. (Figs. 2 and 3). It was in these channels that the larvæ (small, legless, white grubs) were found (Fig. 1 *d*), often more or less concealed by the sawdust-like castings. The holes leading through the bark of such trees into the wood were small and such as would be made by fine shot (Fig. 2); hence the beetle is often called the "Shot-hole Borer." This sort of hole on dead or almost sapless trees and the gummy exudations on healthy trees make the presence of the beetle in an orchard easy to discover. That the insects were still at work late in September was evident from the number of adults discovered and the fresh castings at some of the holes. In one of these holes I found eggs but whether laid by a beetle or some other insect I could not say. I find, however, that some writers state that the winter is passed both in the egg and larval stages. I have not been able to find a reliable account of the life-history of the insect, but it looks very much as if there were more than one brood in a season. I should have mentioned earlier that the first evidence that the cherry tree leaves were beginning to die was about August 1st.

When asked by the fruit-growers what could be done to check the beetles, I told them that the plan ordinarily recommended was to cut down all dead, dying, and badly infested trees and burn them. I said that I believed that spraying was also resorted to as a preventive, but that having had no experience with fighting this insect myself, I should bring the question up at the Annual Meeting of the Entomological Society and endeavor to discover the best method to be pursued in fighting it, and would then send full particulars to the newspapers of the different districts.

Dr. **Fyles**: Is it possible for such a small insect to do so much injury?

Dr. **Fletcher**: Yes, quite possible. We should like to know the life history of the beetle better to be able to give more definite methods of treatment. The first thing to do, however, is to cut out and burn all dead and dying trees and branches. No branches pruned from any kind of tree should be left in brush heaps to become a breeding centre. Any wash applied must necessarily be in the form of a deterrent on account of most of the insect's life being passed under the bark. Carbolic washes have given satisfaction in some places; they are applied in spring.

Mr. **Caesar**: The State Entomologist of Georgia thinks that lime-sulphur carefully applied in late spring should be equally good.

Dr. **Fletcher**: Possibly. It looks as if lime-sulphur were being considered a panacea for all ills. It is helpful in so many things that we may be expecting it to do everything for us.

Mr. **Jarvis**: A few of the Fruit-tree Bark-Beetles are to be found in nearly every district each year on dead fruit-trees, such as cherry or plum. Some healthy apple-trees near here which are badly infested with the Oyster-Shell Scale have been attacked.

Dr. **Fletcher**: It is important to know that Mr. Caesar's observations go to show that healthy trees may be attacked. It used to be thought that it was only diseased or dead trees that were infested. It is from the latter kind of trees that the beetles spread to the healthy ones. According to Webster this Scolytus follows bad attacks of the San Josè Scale; it has been very abundant at Leamington where the scale is common.

The Codling-Worm.

Mr. **Caesar**: I cannot help feeling particularly interested in this question of the Codling-worm. I saw its ravages in the apple orchards of the Niagara district last year and again this fall. I believe that the damage done this year is even greater than that of last year. I visited a good many apple orchards from Fruitland to St. Catharines and I believe that fully 50 per cent. of the apples were rendered unmarketable by worms. Strange to say, comparatively few pears were injured, not more, I think, than 5 to 10 per cent. where the trees had been sprayed with poisoned Bordeaux mixture. The damage to apples, however, was most discouraging. I cannot help feeling that the farmers do not know how to deal with the pest. Some of them use poisoned Bordeaux and bandage their trees as well and yet have simply hosts of Codling-worms. It may, of course, be that the spraying is not done at the right time and that the bandages are either not properly put on, or not opened and the worms taken out so frequently and thoroughly as is necessary. Something will have to be done or else farmers will give up apple growing in that district. I know one man who will have from 8,000 to 10,000 barrels of apples this fall, but of these fully 4,000 barrels will be unfit to put on the market, simply on account of the Codling-worm.

Prof. **Hutt**: The Codling-worm has certainly been very bad this season in the Niagara district and the remedies applied are not sufficient. The fruit-growers do not seem to know how to fight the pest.

Mr. **Jarvis**: I do not think many of the farmers bandage their trees, and some who do fail to remove the bandages once every ten days as they should.

Dr. **Fletcher**: Great care should be taken to see that all the worms under the bandage are destroyed each time.

Mr. **Caesar**: This is greatly facilitated by the trees being scraped in the winter.

Dr. **Bethune**: Do the farmers gather up the fallen apples each day and destroy them, or sell them to cider factories?

Mr. **Caesar**: There are many orchards where the fallen apples are not gathered; in fact I think that in none of the orchards is this done daily.

Dr. **Bethune**: Could they not in some cases let their hogs or sheep run in the orchards?

Mr. **Caesar**: Most of the orchards are not fenced, and very few hogs or sheep are reared.

Dr. **Fletcher**: If the fruit-growers will spray with poisoned Bordeaux at the proper times and will put bandages on when the worms are beginning to emerge from apples, and remove these at least every tenth day and destroy the worms underneath, they will control the Codling-worm. At Ottawa we have had no Codling-worms in our orchard on the Experimental Farm for ten years because regular spraying has been done; and even in districts where there are two broods similar good results can be obtained.

Mr. **Caesar**: Do all the worms that fall to the ground in the apples, or otherwise, find their way up under the bands? Do not a large number hide under lumps of earth or any kind of refuse or shelter on the ground?

Dr. **Fletcher**: Many of course will get under the bark below the bandage, unless it has been scraped; some will hide under loose bark around the base of the tree or under boards, but I do not think any pupate under lumps of earth or among grass, at least I have never found any.

Apple growing in the Niagara district is not considered so remunerative by the fruit-growers there as the raising of peaches and other kinds of fruit, so that there has been a great deal of neglect of apple orchards, with the natural result that every opportunity has been given to the Codling-worm to increase at a very rapid rate, and even where one farmer looks after his orchard well, the neglect to do this on the part of his neighbor prevents satisfactory results being obtained.

Mr. **Jarvis**: I should like to call the attention of the members to the fact that the O. A. College orchard has been carefully sprayed this year at the proper time in the spring, and twice later on in the season at the usual intervals, and very few, not more than 5 per cent. of the apples are wormy. We have not a full second brood here but have about 15 per cent. of a second brood in ordinary years. A few trees on the campus that were not sprayed had almost every apple wormy. One could scarcely want clearer evidence of the value of spraying.

THE OYSTER-SHELL SCALE OR APPLE-TREE BARK LOUSE.

Prof. **Hutt** was asked by the chairman to open the discussion on this subject. He related his observations in different parts of the province and stated that last year had been a very favorable one for the increase and spread of this scale, and that this year he had heard many reports of its great abundance, especially in the counties of Northumberland and Ontario. He thought it was doing a great deal of injury to fruit trees, especially apple trees all over the province

A **Member**: Are many other kinds of trees attacked by this scale besides apple trees?

Mr. **Jarvis**: We have found it at Guelph on apple, pear, plum and cherry trees; on currant, gooseberry, rose, spireas and lilac, and also on numerous forest and shade trees, such as mountain ash, hawthorn, red-osier, dogwood, basswood, both black and white ash, American aspen, horse-chestnut and mulberry trees.

Mr. **Caesar**: I think that from what I have seen this year there will not be half the number of Oyster-shell scales next year that there were last. The scale-lice hatched out all right this June and the branches of many trees were almost covered with the young. I examined some of these same trees a few weeks ago and found that the great majority of the young scales had not lived through the season, but had died when only a few weeks old.

Dr. **Bethune**: Some experiments that have been made with lime-sulphur wash seemed to show that it is not entirely satisfactory as a remedy for this scale, though it destroys a large number of them.

Dr. **Fletcher**: It is not usually considered a perfect remedy for Oyster-shell scale.

Mr. **Crow**: I sprayed a few trees here with the ordinary kerosene emulsion, and some others with the flour-kerosene mixture. The spraying was done just when the young had hatched out and were moving over the branches. The results were very satisfactory. I can bear out the statements made as to the prevalence of this scale throughout the province and the vast injury it is doing, but I agree with Mr. Caesar that from some cause, whether it be the late spring and cold weather after the young emerged, or whether it was owing to rains at that time, there seems to have been a very great diminution in the number of living scales this fall.

Mr. **Nash**: My experience makes me agree with what has been said in regard to the decrease this year in the number of scales. This spring I noticed one of my trees late in June swarming with young scales. I examined the same tree not long ago and was amazed to find scarcely a living scale on it.

Dr. **Fletcher**: This is not the case in all parts of the province. I was interested in Mr. Crow's remarks about the success of the kerosene emulsion and flour-kerosene sprays. These may be considered the standard remedies against the Oyster-shell scale.

Mr. Caesar: The orchards in the Niagara district, that two years ago were badly infested with Oyster-shell scale and were sprayed last year and again this year with lime-sulphur, seem to be quite clear of this scale.

Dr. Fletcher: Wherever an orchard is sprayed year after year with lime-sulphur or even with Bordeaux mixture, the Oyster-shell scale gradually ceases to trouble. I have always found, moreover, that the healthier you can make your trees, the less likely are they to be badly attacked by Oyster-shell scale. Lime-sulphur helps the tree to be healthy.

Mr. Caesar: I found that in some orchards almost 50 per cent. of the scales were parasitized by a tiny yellowish four-winged fly (a Chalcid). Mr. Jarvis and I raised a number of these parasites this spring.

Dr. Fletcher: I have seen a case where 80 per cent. were parasitized, but I am sorry to say that the parasite does not work in all parts of the province, as it is only locally abundant.

Mr. Crow: Mr. Dempsey, of Trenton, thinks the parasite has controlled the scale in his orchard.

Mr. Jarvis: A fungus is also attacking the scale. It is of a pinkish orange color, and probably is the same one that attacks San Jose scale. I found it on some specimens of Oyster-shell scale sent to me recently. It is also found at Guelph.

Dr. Fletcher: That is very interesting. I have found this fungus in one or two places but not in Ontario. If you possibly can you ought to try to spread the fungus, Mr. Jarvis. Try inoculating oyster-shell scale and San Jose with it in different orchards. Valuable results might possibly be obtained, at any rate it is wise to try it.

Mr. Jarvis: We have also found a tiny little mite that destroys the eggs. I have seen the statement made that it does not destroy them, but my experience, I think, justifies what I have said. The eggs where these mites were found in the spring were nearly all destroyed, or in some cases were brown in color and clearly never could hatch. In our class work, when examining the scales under the microscope, we have found a large number of scales with these mites in them.

Dr. Fletcher: We have then three friends to help us in fighting this scale, namely, the four-winged chalcid fly, the mite, and the fungus.

The Terrapin Scale.

A very brief discussion of this much talked of scale (*Eulecanium nigrofasciatum*) took place :

Dr. Fletcher: Have any of you had definite information that a satisfactory remedy for the Terrapin scale has been discovered?

Mr. Jarvis: I have not seen the results of any work on the scale further than the statement that lime-sulphur would not kill it.

No one else had any experience with remedies to relate, so Dr. Fletcher said that he had been informed, or had seen a statement that kerosene emulsion utterly failed to kill the insect.

Dr. Bethune: The scale has only been reported from three places in Ontario, viz., Walkerville, Windsor and St. Catharines. It does not seem to be spreading. Only maple trees were attacked.

Dr. Fletcher: What remedy did you recommend?

Dr. Bethune: I recommended that the trees shoud be cut down and burned, which was accordingly done.

THE WOOLLY APHIS.

Prof. **HUTT** brought up the subject by remarking that the Woolly Aphis was very abundant this year in some districts.

Mr. **JARVIS**: I should think it was. In the orchards around here nearly every young tree has every little crevice or wound on the bark filled with them.

Mr. **CROW**: I have noticed that they are very bad in the College orchard, but I do not think they have injured the trees much.

Dr. **FLETCHER**: When did you notice that they were numerous? Was it in summer or autumn?

Mr. **JARVIS**: In autumn.

Dr. **FLETCHER**: Has anyone ever found the Woolly Aphis in the root form in Canada? Personally I never have, though it is found in the United States and does much injury there.

Mr. **FRIER**: When we were taking up some young conifers in the Forestry Department this year, we found a great number of Woolly Aphids among the roots. Would these be the kind you refer to?

Dr. **FLETCHER**: No, these are a different species. "Woolly aphids" are found on many kinds of trees and there are many different species.

Prof. **HUTT**: It is very interesting to see the chickadees eating these insects. They seem to devour them with great relish, and soon destroy a great number of them.

BEES AND THE YIELD OF FRUIT.

Prof. **HUTT**: I should like to call the attention of members to the lack of bees for fertilization this year. I am told that in many districts nearly 80 per cent. of the bees perished during the winter or early spring. Added to this the fact that during the blossoming season we only had a few really good days for the bees to work. I believe it was owing to this that so small an amount of fruit set this year, smaller than usual. I firmly believe that fruit-growers should keep more bees. I notice that men who keep bees have a better set of fruit. Mr. Dempsey, of Trenton, is a good example of these men. He has bees and never fails to get a good set of fruit.

Dr. **FLETCHER**: I am glad you brought this subject up. Mr. Macoun, of the Experimental Farm at Ottawa, called my attention to the splendid crop of apples we had this season, whereas the apple crop for miles around Ottawa was almost a failure. The only explanation I can find is that we had bees to help us and other people had not.

Prof. **HUTT**: Do wild bees assist to any extent in the fertilization of fruit blossoms?

Dr. **FLETCHER**: Certainly, but not to the same extent individually as the honey bee. The latter seems to be especially built for this purpose. He seems to delight in getting covered all over with pollen and conveying it from one blossom to another.

Dr. **BRODIE**: Many families of wild bees do a great and excellent work in fertilization; especially is this true of the great family Andrenidæ, of which there are about 100 species; the Syrphidæ and Halictus, also, do good work in fertilizing fruit blossoms.

SAN JOSÉ SCALE.

A short discussion on this scale was brought about by the reading of the following letter from Mr. J. Fred. Smith, San José Scale Inspector for Ontario:

"One of the most noticeable things in connection with the San José scale this year was the lateness of the commencement of the breeding season; and owing to the lateness of the spring in opening large numbers of them starved to death. Another peculiarity therewith was that this was most noticeable on heavy cold soils. On the warmer and earlier soils they have done fairly well. In other words in all those sections where early gardening is done and where vegetation started early the sap also began to flow earlier, and as this is their food they were consequently started in their work of destruction in good shape.

"I am also pleased to inform you that never before was there so much treating done for its destruction. Lime and sulphur was the almost universal remedy and so much sulphur was used that there was a sulphur famine. At Leamington, towards the last of the season, none could be got at all. In village and small town lots considerable Target Brand and Carlson's Mixture was used, but on account of the large quantity of scale that were winter killed it was almost impossible to form an opinion as to their value. At Leamington I made an inspection, along with the local Inspector, of several lots treated with Target Brand, and as I was not then aware of the large quantities winter killed I had to give the Brand credit for doing the good work; but later I found some lots that had not been treated at all and there was very little life to be found. The examination at Leamington was made on the 5th of July. On the 30th of July, at Bartonville, on trees which had not been treated for the scale larvæ were to be found running, which is the latest that I have ever seen in Ontario."

MISCELLANEOUS.

The remainder of the time set apart for the conference was employed in discussing a variety of insects, respecting which information was desired. For the potato flea-beetle it was stated that Bordeaux mixture had proved to be the best remedy, and also for that attacking cucumbers; poisoned-lime is useful for the grape-vine flea-beetle and is made with Paris green and lime so thick that it can only just be sprayed. For the oyster-shell scale the lime wash (made in proportion of one pound of lime to a gallon of water) has proved entirely satisfactory. It should be applied in the autumn as soon as the leaves have fallen, and be repeated a few days later. Two applications of this thin wash are more effective than a single one made with double the amount of lime. For slugs attacking celery, freshly slaked lime was recommended, to be put on before hilling up the plants, and repeated for two or three days in succession. The lime sticks to the slimy bodies of the slugs and kills them through its caustic effects.

Mr. W. R. Thompson mentioned that millipedes attacked tomatoes in large numbers at Ste. Anne de Bellevue this summer, especially injuring any fruit that touched the ground. The chairman advised as a remedy a dressing of nitrate of soda.

REPORTS ON INSECTS OF THE YEAR.

DIVISION NO. 1,—OTTAWA DISTRICT. BY C. H. YOUNG, OTTAWA.

During the past season I regret to say I have been unable to devote as much time as I should have liked to the study of the insects of the Ottawa district, which have appeared in destructive numbers.

The following notes, however, are submitted:

The small White Cabbage butterfly (*Pontia rapæ*), was very plentiful in the district and its ravages in neglected gardens could be easily seen. It was particularly troublesome towards the end of August. On August 22nd I visited a large garden at Billing's Bridge, near Ottawa, and here the injury was to cauliflowers. The insect-powder remedy is such a simple one that I cannot understand why growers of cabbages and other plants which are attacked, allow this insect to destroy their crops.

The Colorado Potato beetle (*Leptinotarsa decemlineata*) was particularly abundant in many potato patches. Although the season was a poor one for potatoes, those growers who sprayed with the poisoned Bordeaux mixture were well rewarded.

Grasshoppers were very numerous at Meach's Lake, Que., near Ottawa. In one garden of a friend of mine all the flowering plants were completely destroyed, while in another large garden about half a mile away flowering plants were saved by allowing chickens to run in the garden. This is another instance of the value of poultry in reducing the numbers of injurious insects.

When these domestic animals once acquire the habit of feeding on grasshoppers and cutworms, they become of so much more value to the owner. At Billing's Bridge grasshoppers were also noticed injuring cauliflowers and other crops of vegetables.

The Fall Webworm and the Yellow-necked Apple-tree caterpillar appeared in considerable numbers and their injuries were very apparent throughout the district. Where these insects were troublesome on shade or ornamental trees, the simple remedy of cutting off the infested branches was resorted to. Halisidota caterpillars of two species, the Hickory Halisidota (*Halisidota caryœ*) and the Spotted Halisdota (*H. maculata*) were responsible for much injury to the foliage of many trees and other plants in late August and early September. At Rockliffe Park, near Ottawa, the caterpillars of the Spotted Halisidota were abundant on willows, basswood and Wild Rose.

Several colonies of the Black Walnut worm (*Datana integerrima*) were observed as very destructive to cultivated Black Walnuts and Hickories. This insect, however, cannot be usually considered an injurious one at Ottawa as it does not occur in sufficient numbers to do serious damage. Cutworms, while troublesome in some gardens, were not responsible for very much damage, as far as I know, in the district, during the past season. The poisoned bran remedy is becoming more widely used every year.

Root Maggots, too, were not in such numbers as to cause much anxiety to market gardeners during the season of 1907.

DIVISION NO. 2.—MIDLAND DISTRICT. BY C. E. GRANT, ORILLIA.

The year of 1907 was a remarkably backward season; on the 27th of May I walked home in half an inch of snow and the wind blowing a blizzard, then a short three months of summer which was excessively dry.

No very serious complaints of insects were reported to me.

There were, however, widespread complaints of the Buffalo-beetle, which has apparently invaded most houses and no efficient remedy seems to have been found or else the remedy is not properly applied.

The currant saw fly and the codling moth were also very bad this year and the apples here (in fact most fruits) were small, therefore the crop was poor. The cutworms were also rather plentiful.

Though perhaps not doing much damage, the Walking-sticks were to be met with very often and lots of people brought them to me, who before would have been ready to swear that there was no such insect in existence.

Grasshoppers were very plentiful late in the season and devoured a lot of the leaves which were left after the drouth.

Late in September immense numbers of the Buprestid (*Chrysobothris femorata*) were running over the cement walk of the main street and were crushed by pedestrians. I tried to trace the source of the supply but could not.

The Fall Web-worm was very much in evidence. I also noticed the remarkable number of Halisidota and Acronycta or Apatela caterpillars; they were all over the fences and until quite late in October. I took two specimens of Telea polyphemus in August, quite an unusual occurrence.

I have only added one new moth to my locals this years, viz., *Plagodis keutzinzii*.

DIVISION NO. 3.—TORONTO DISTRICT. BY J. B. WILLIAMS, TORONTO.

The Tussock Moth still continues to do a good deal of damage to the shade trees in Toronto, though they have not been quite so numerous this summer, as far as I have observed, as they were a year ago. The comparatively cool weather may have acted to some extent as a check upon their numbers, or possibly parasities are beginning to get the upperhand, and we may see their gradual diminution by natural causes, during the next few years. They have certainly appeared for some time past to be having everything their own way.

The Tent caterpillars have been numerous round Toronto, and I saw a good many of them in the country round Lake Simcoe.

The Codling Moth has been very destructive to many apple trees in the city gardens. In the same orchard some trees have hardly been touched by them, while others have had almost every apple more or less injured by the ravages of this injurious pest.

Though the Walking-Stick insects were very numerous last year at Niagara Glen and swarms of them had stripped several large trees of their foliage, I failed, this year, to find a *single specimen* on two or three occasions when I visited the place. What can have been the cause of their sudden disappearance?

DIVISION NO. 4.—EAST YORK DISTRICT. BY C. W. NASH, TORONTO.

The past season seems to have been an unfavorable one for the development of most forms of insect life. Butterflies were particularly scarce, even the common species which usually swarm about the garden and over fields of blossoming clover, being conspicuous by their absence. I did not see one Monarch Butterfly (*Anosia archippus*) until the first week in August, after which a few were noticed every day, but so far as I could observe, there was no congregation prior to migration, and no regular flight in September such as usually takes place along the shore of Lake Ontario from east to west, when the insects are on their journey to the south. On the other hand many were here later than usual; a few having remained until October, 5th, when the last were seen.

Cosmopepla carnifex.—During the past few years this beautiful little hemiptera has been gradually increasing in numbers until in June, 1907, it became enormously abundant on Aquilegia, Antirrhinum and Pentstemon in gardens. On the 25th of June all the plants of these genera in this neighborhood were covered with the insects and a vast number of eggs had been deposited upon the main and flowering stems of the plants. I was curious to know what would happen when all the eggs were hatched for it seemed as if they would produce enough insects to over-run the country. Apparently the season was unsuitable for the development of the nymphs or one of the many disasters to which "feeble folk" are subject overtook them, for by August there were no Cosmopeplas to be seen. The millions of adults which appeared in the spring had all passed away and there were none of their progeny to represent them.

I have not yet been able to discover what this insect feeds upon. As it resorts to Aquilegia, Antirrhinum and Pentstemon and upon them its eggs are deposited, it would seem that these plants should supply its food. Yet although hundreds of adult and immature Cosmopeplas may be upon a plant, no perceptible harm is ever done to it, and all my efforts to raise the nymph from the eggs have proved abortive, though I kept them well supplied with shoots from the plants upon which the eggs were deposited. I tried them also with Aphides under the impression that perhaps they lived upon the juices of other insects, but this too was a failure.

Locusts.—Just before harvest time locusts became troublesome in the oat fields, where they did some damage by cutting off the ripening grain from the stalk and dropping it to the ground. In some fields the soil was covered with the grain so cut off. Under ordinary circumstances the loss would be somewhat serious, but this year, owing to the short crop, is doubly so.

The Stalk-borer (*Gortyna cataphracta*).—Perhaps the worst enemy vegetables growers and florists have to contend with now is the larva known as the Stalk-borer. This creature has increased rapidly in numbers during the past five years and unless it is checked by some of its natural enemies will cause great loss and annoyance, as it is almost impossible for man to control it by any mechanical means. During this past season I took over two dozen larvæ from the stems of plants in my garden of about a quarter of an acre and I received great numbers from market gardeners and florists both amateur and professional of this district. It is practically an omnivorous feeder, any plant, either wild or cultivated, having a stem large enough to contain it being liable to attack and unfortunately the infested plant shows no sign of infestation until the larva has eaten out the heart of the occupied stem. When this occurs the stem breaks off or its leaves wither and die. If it is the main stem which is occupied, as is generally the case with tomatoes and corn, the plant is ruined.

I have not yet been able to ascertain where or when the moth deposits the eggs from which the larvæ are produced. It might be that the moth hibernates and deposits its eggs upon the shoots of plants in the spring, but I have not yet found an adult dormant, nor have I seen it in the spring.

In July the work of the larvæ is first noticeable, and a rather peculiar thing is that, almost up to the end of the month, larvæ varying in size from about one-third to full grown may be found in close proximity; this year I found on the fourteenth of July a number showing among them even greater variations than that.

About the twenty-fifth of July the more advanced specimens begin to enter the pupal stage, the smaller ones continuing to feed sometimes well on into August. Early in September the moths begin to emerge and continue doing so until the end of the month when they are at the height of their abundance, and on dark nights come to light in large numbers. This year they were rather later than usual and I did not see as many moths flying as in 1905 and 1906. In the latter year they were very abundant at light on the night of September 26th, which was dark and rainy.

Although I have bred a great many of these insects from the larval state to maturity, I have never found one parasitized and their method of life, no doubt, protects them largely from enemies of this class.

The Tarnished plant bug, though still more in evidence than was pleasant, did less mischief than usual, and Aphides, though rather abundant in spring, became less so as the season advanced. Dragon-flies were very scarce indeed, so much so that in the marshy meadows where they usually abound I did not see this summer, one for every hundred generally to be found in these localities. Bumble -bees also were far less numerous than they should be for the good of the country. Of the five or six nests provided by me for them, not one was occupied, though for the previous five years every one has been tenanted.

Division No. 6.—London District. By J. A. Balkwill.

In this neighborhood we have been fortunately, almost exempt from serious injury from insects with one noteworthy exception that was an unusually large number of cutworms which attacked almost every kind of garden vegetable even boring into onion stalks; one party tells of taking 30 off one tomato plant; the larvæ were nearly full grown and soon went into pupation.

The Cottony Maple scale which disfigured our maple trees for a number of years has almost entirely disappeared.

The Tussock moth we have in considerable numbers but not numerous enough to cause alarm.

Nothing is heard about the Pea Weevil although an occasional one is found in the peas which were sown early.

After these reports were read, a short discussion followed, in the course of which Prof. Hutt said that the Rose Chafer was very injurious near Leamington this year. The English Sparrow had developed a taste for them and devoured great numbers. This is one point to be scored in favor of these birds. Mr. Cæsar said that he had been sent some specimens of insects from Toronto which were reported to be destroying almost everything in a garden. They proved to belong to the Fulgoridæ and were identified by Dr. Bethune as *Ormenis pruinosa*, Say. They seemed to be fairly numerous about Toronto and were found on tree trunks when he visited the city about the middle of July.

EVENING SESSION.

Thursday, October 31st, 1907.

In the evening Mr. A. H. Kirkland, of Boston, who is in charge of the efforts now being made in Massachusetts to suppress the Gypsy and Browntail Moths, gave a highly interesting account of the work and the results that have so far been accomplished. His address was illustrated with a series of lantern pictures which graphically showed how the operations are carried on. He described also the importation of parasites and some predaceous beetles from Europe, and the amount of success which had so far attended their efforts to breed them. Dr. Fyles followed with one of his charming papers "The Voices of the Night." Much regret was expressed that the attendance was small owing to the attractions of the holiday, it being Thanksgiving Day and Hallowe'en

THE GYPSY AND BROWN-TAIL MOTHS IN MASSACHUSETTS.

ABSTRACT OF ADDRESS BY A. H. KIRKLAND, SUPT. OF GYPSY MOTH WORK, BOSTON, MASS.

After congratulating his audience upon the evidences of agricultural prosperity shown in the parts of the province through which he had passed, and speaking of the serious loss to agriculture often inflicted by injurious insects, Mr. Kirkland took up the matter of imported insect pests, and explained why they were so much more injurious to crops and trees than native insects.

"In a state of nature, every insect has its enemies, such as birds, diseases, and, most important, insect parasites. When an insect pest is transported thousands of miles to another country, and is thus freed from its natural enemies, it multiplies remarkably, and causes much greater damage than when in its native environment, simply because it is relieved from those checks which nature has provided for it. Thus the San José scale is much more injurious in this country than in its native home in Northern China. The Elm-leaf Beetle and the Gypsy and Brown-Tail Moths also give striking illustrations of this fact. These two moth pests have caused most serious havoc in eastern New England, have spread rapidly, and one, at least, the Brown-tail Moth, occurs in the Maritime Provinces of Canada."

The speaker then described the importation of the Gypsy-moth to Medford, Mass., by Professor Leopold Trouvelot in 1868, its accidental escape from his care, and its slow but constant spread throughout the neighboring towns. "Recognizing the importance of the catastrophe, Professor Trouvelot promptly gave notice to Doctor C. V. Riley, then State Entomologist of Missouri, and also to Doctor Hagen, at Harvard University. Unfortunately, no great importance was attached to the matter, although at this time $1,000 would have cut and burned over the many acres of brush land in the vicinity of Profesor Trouvelot's home and wiped out the incipient moth colony. The moth increased unrestrictedly for some twenty years, but in 1888 the public of Medford and vicinity suddenly woke up to the fact that they had a serious caterpillar plague on their hands, and at once made vigorous efforts to combat it. One year's experience was sufficient to show them that individual effort could not control this formidable pest, and the aid of the cities and towns was invoked. Another year convinced the cities and towns in turn that they could not fight the insect unaided, and the State of Massachusetts was asked for help. The work in Massachusetts began in 1890 and was continued until February 1, 1900, principally under the auspices of the Massachusetts Board of Agriculture. This work suffered in certain critical years from lack of sufficient appropriations, or from appropriations not made in season for most effective action. At the same time. great progress was made in bringing the insect under control, until in 1900 but few moths could be found anywhere in the infested region. The insect had been thoroughly suppressed by the application of hand methods, so-called, many of which were invented to meet the needs of the work. In 1899 not over ten acres of woodland were stripped in the entire infested district, which embraced some 350 square miles. In 1900, although it was pointed out to the Massachusetts Legislature, that scattering moths remained here and there in the district, that body, in its wisdom, saw fit to discontinue the work, partly from political reasons, in spite of the protests of entomologists who thoroughly realized the gravity of the situation, because of the prolificacy of the moth. During this campaign about $1,250,000 was expended, and the moth had been brought thoroughly under control. The insect at once began to increase steadily, yet nothing more was done in the warfare against the moth pest until 1905, when the caterpillar plague had again become such a nuisance that the work was resumed under a co-operative plan whereby the citizens directly bear part of the expense of supressing the insect, cities and towns another part, and the State the major part. In other words, the present scheme of work involves a direct co-operation of property owners, cities and towns and the State, under the general direction of the central office, thus insuring uniformity of action. Under this scheme of work, upward of $750,000 was expended during 1906, and as much will be laid out the present year.

"The principal means by which the Gypsy moth is spread over its present area of some 2,800 square miles, is through caterpillars spinning down from the trees and dropping on automobiles, teams, cars, etc. Fortunately, the female moth does not fly but the insect spreads rapidly in the manner mentioned. A volume might easily be written on the means by which the Gypsy moth is spread. The young caterpillars spin down by thousands from neglected, infested trees in May and June. Where such trees overhang highways, every milkman, every grocer, every garbage man, in short, every vehicle gathers them and carries them to a greater or less distance, thus founding innumerable new colonies. In the badly infested district regular daily traffic of the classes mentioned above is most dangerous. Long distance scattering of the moth is effected principally by pleasure driving, electric cars, and what is most important of all, automobiles. The advent of the latter class of vehicles has greatly complicated the prevention of the spread of the pest, and makes it all the more imperative that we should keep clean the trees that border our main roads. Other minor methods of distribution are eggs deposited on barrels, packing boxes, summer furniture standing out of doors, etc.

"The Brown-tail Moth found its way to Somerville in the early nineties no doubt on rose bushes imported from Holland. The evidence in this case is circumstantial but strong. The insect is known to occur in Holland, is known to form hibernating webs on roses, and the place where it was discovered in Somerville, Mass., in 1897, was directly in the rear of a florist's establishment, where a specialty was made of importing Dutch roses, growing them for a season and then selling them to the Boston department stores. The female moths of this species fly freely, and are often carried long distances by the wind. They are also strongly attracted to light. Cases are on record where these strong flying females have come on board vessels some thirty miles off the New England coast. It is not surprising then that the Brown-tail Moth has already spread to Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, New Brunswick and Nova Scotia. The line of spread is naturally that of the prevailing winds during July, which in New England usually blow to the north-east. It seems probable that in comparatively few years this insect may be found generally scattered throughout New England and Eastern Canada.

"The biology of the insects is briefly this: in the case of the Gypsy Moth the eggs hatch about the last week in April, the caterpillars, which feed on all kinds of foliage are full-grown about the middle of July. Words cannot describe the havoc wrought by these caterpillar swarms. In early July of the past year, some 3,000 acres of mixed woodland in Eastern Massachusetts were defoliated by the gypsy caterpillars, and left as bare as in winter. They feed on all trees, nearly all crops, and often invade houses by the hundred. No more pitiful and at the same time disgusting sight can be conceived than a gypsy moth outbreak at its height. No wonder that in the olden days before the science of economic entomology was dreamt of, people so afflicted sought a remedy through prayer, or that they regarded the pest as a device of the Evil One. The pupal stage extends to about the 1st of August, while the moths are from a week to ten days in depositing their yellow, hair covered egg clusters. The egg clusters are laid on tree trunks, stone walls, houses, fences, and old tin cans—in fact, in all places where the caterpillars may go to pupate. The female seldom moves far from the pupa case from which she has emerged.

"With the Brown-tail Moth the eggs hatch about the middle of August, and the young caterpillars feed at the tips of the twigs, preferably those of fruit trees, until the approach of cold weather, when they draw together the leaves from which the epidermis has been removed, and spin them up with a most tenacious web, thus forming a hibernaculum within which they congregate to the number of two or three hundred, and thus safely pass the winter. The same warm weather that causes the buds to swell the following spring brings out these small caterpillars, which feed on buds, blossoms, and leaves, and when abundant, often strip entire orchards and groves of oak. Aside from the damage to trees the hairs of the caterpillars are intensely poisonous and cause a severe and most painful eruption of the skin whenever they come in contact with it. By the middle or latter part of June, the insects are fully grown when they spin cocoons, often in masses at the tips of twigs, on fences, and even house walls. From the 12th to the 15th of July the white, brown-tail moths emerge, fly freely, mate principally by night, and the females at once begin the work of oviposition. Some four or five days are consumed in this process by which time the brown, elongated, hair-covered egg masses have been securely attached to leaves at the tips of twigs. Hatching takes place in from three to four weeks.

"For remedial measures against the Gypsy Moth we have found spraying done in the early caterpillar season the most valuable of any single method. Power sprayers, throwing the spray under heavy pressure have proved the most economical, as far as street tree and orchard work is concerned, and also, in those woodlands which are accessible to heavy machines. In woodland spraying, however, the thinning of trees, and cutting out of underbrush is an indispensable prerequisite, and this preliminary work is usually done during the previous fall and winter months. In spraying against the Gypsy Moth, arsenate of lead paste at the rate of 10 pounds to 100 gallons of water gives the best results. On rough or rocky hillsides, and in other places where the power sprayer cannot be worked to advantage, hand spray pumps are freely used with good results. As the caterpillars approach maturity, they show considerable resistance to poison, and further acquire the odd habit of feeding by night and hiding by day in sheltered places. Taking advantage of this habit we band the infested trees with strips of burlap, beneath which the caterpillars assemble in the early morning hours, and where they may be destroyed at any time by hand during the day. Later in the season, the pupæ and female moths are crushed by hand or creosoted wherever found, while after the eggs are laid coal tar creosote applied with a brush to the egg masses completely destroys them. This creosoting of the egg masses is carried on throughout the fall, winter and spring, and is a most effective though somewhat expensive method. In badly infested woodlands we thin the trees, cut the brush and treat the egg masses on the trees left standing. The following spring we band the remaining trees with some sticky material to prevent the ascent of the young caterpillars, and as soon as all the eggs on the ground have hatched, a light fire is run over it, thus destroying the caterpillars by the million. These are the principal methods directly used for destroying this insect. As a matter of policy we have attempted first to stop the scattering of the moth by treating a 100 foot belt on each side of all our main roads. This prevents the caterpillars from spinning down and dropping on vehicles. In this way, over 8,000 miles of roads have been covered during the present season. Next, we have endeavored to do the greatest good to the greatest number of our people by clearing all the important residential sections of the moth, and certainly 90 per cent. of them have been so cleared and protected. There now remains the great woodland problem concerning which we are most anxious, but which we can solve if given sufficient time and money.

"In combating the Brown-tail Moth the natural and most effective measure is to cut off the winter webs, gather them carefully and burn them. This work is best done when snow is on the ground. Where this has been neglected a spraying with arsenate of lead, six pounds to one hundred gallons of water early in the spring will suffice to destroy the insects. In actual field practice the winter work of cutting off brown-tail webs, and of creosoting gypsy moth nests goes on at the same time and with the same gang.

"In opening this informal talk I spoke of the balance of nature; and how injurious insects in their natural environment are ultimately held in check by their parasites. In Eastern Massachusetts we are endeavoring to secure this balance of nature in connection with the moth pests by the importation from Europe of the parasites of both moths. Our State has made liberal appropriations (some $45,000) for this work, which I have placed under the oversight and direction of Dr. L. O. Howard, Washington, D.C., than whom no one in the country is better qualified to direct. Dr. Howard has made several trips abroad for us and engaged a competent corps of collectors in all parts of Europe where the moth occurs. He has also given us the benefit of his advice at all times, and the services of one of his trained assistants who has spent nearly all his time in Eastern Massachusetts looking after the material when it arrives. We have provided for this important work a well-equipped laboratory, and a large number of assistants, and during the past year over 100,000 different forms of parasites of the moth have been bred from European material and liberated in our infested district. We have imported several important Ichneumonids, a very large number of Pteromalids, thousands of Tachinids, and also a large number of predaceous beetles of the genus *Calosoma*. When a sufficiently large number of any of these parasites is obtained at any one time they are liberated directly in the field. Otherwise, they are bred up to the requisite number in outdoor cages and then liberated. What the outcome of this exceedingly interesting scientific experiment shall be, is, of course, problematical. We know already that certain important imported species have established themselves in our State, and are hopeful that another season will show that many others have done likewise. At any rate, the best available scientific skill is being brought to bear on the problem, while ample financial support has been provided by the State. Both Dr. Howard and myself are very hopeful for the successful outcome of this undertaking. If it can not be gained under present conditions, it can not be gained at all.

"While such great insect invasions are at first glance most discouraging, I am not one of those who regard them wholly as an unmixed evil. I believe that there is in them a certain element of benefit to the community at large. By the attacks of these hordes of insect pests we gain a better appreciation of the value of our trees and crops. We are led to study their needs more closely and to administer to those needs more thoughtfully and efficiently than before, and from thus getting in closer contact with a few forms of life our interests and sympathies become broadened in their relation to the whole living world."

VOICES OF THE NIGHT.

By Rev. Thomas W. Fyles, D.C.L., F.L.S., Levis, P.Q.

Eight years of my early life in Canada were spent in a very beautiful, but comparatively newly settled district in which there was much of the primeval forest remaining. Some of the first settlers were still living there when I took up my abode in the neighborhood. These men told of the nightly howling of the wolves on the hills when they first began to clear the lower lands, and of their encounters with various wild animals in the woods.

My duties at that time took me frequently from home, and my solitary return journeys were necessarily made at night. Driving on the mountain roads, and through the forest, and by the lakes and streams of the locality, I had fine opportunities for studying the "Night Side of Nature"—I use the words in a different sense from that in which Mrs. Crowe used them.

I pity the man who, living in the country, cannot find, at all hours, by day or night, in summer or winter, sights and sounds to interest and instruct him. I pity the man to whom

"The gracious prodigality of Nature
The balm, the bliss, the beauty and the bloom"

do not appeal. A solitary drive on a country road has always been to me an occasion for rich enjoyment. The many voices of animate creatures—aye, and by a figure, of inanimate objects, also, have formed for me, many a time, a concert well worth listening to.

To speak of the voices of inanimate things I shall never forget one glorious night when the Aurora Borealis held possession of the sky. From the zenith to the horizon, like the ribs of a vast umbrella, but streaming, quivering, vibrating, the rays descended on every side, I stood in admiration, and became conscious of a strange sound. Was I mistaken? I listened intently. I could hear the distant fall of the water over the mill-dam—it was distinct from that. It was like the gentle shaking out of a stiff piece of silken goods. It was a sound of which travellers in Arctic regions have told us—it was the voice of the Aurora.

Who is there who has passed through a grove of pines in the darkness but has noticed the slumberous sighing of the foliage shaken by the night air? I have often listened to it.

Turning now to the consideration of the notes of animate creatures—what a mournful cry was that of the Loon, or Great Northern Diver, as it passed from one sheet of water to another! It was a weird sound coming from far overhead in the stillness of the night, and soon to be answered, from near or far, by the cry of the companion bird.

Sometimes, in the spring or fall, it was very startling to the lonely traveller in the night to hear a—

"—rush as of harpy wings go by."

accompanied by a constant trumpeting of "*conk-conk.*" Looking up, he would see a phalanx of dim forms speeding onward as if to charge an enemy. The sounds came from a flight of wild geese winging their way, to or from, their breeding-ground in the north.

And these sounds would, perhaps, arouse a fox, who would answer them from the hill-side with his short sharp bark.

In those days I often heard the rollicking hearty call of the Great Horned Owl, "*Wo-a-ho-a-hoa,*" shouted from one mountain top, and answered from another by its mate.

Birds of this fine species were numerous in that neighborhood, and sometimes became so bold as to visit the farm yards. A farmer on opening his door early one morning, saw a splendid specimen of the kind blinking and looking very wicked, and fastened to a large, white gander that it had killed. In its efforts to fly off with its prey, it had dug its claws deeper and deeper into the flesh, till it was unable to disentangle them; and, as the gander was too heavy for it to lift, the spoiler became a captive.

A cry less frequently heard, and heard only in the Winter was the dull, heavy "*Bump-bump*" of the Snowy Owl. This bird comes south in the cold weather, but breeds in Arctic regions.

Another sound that I often paused on my way to listen to, was in those days accounted a mystery. Its cause was not known. I will read to you what Gosse, the Canadian Naturalist, said of it:—

"Listen to the singular sound proceeding from yonder cedar swamp. It is like the measured tinkle of a cow-bell, or regular strokes upon a piece of iron quickly repeated. Now it has ceased.

"There it is again. I will give you all the information I can get about it; and that is very little. In Spring, that is, during the months of April, May, and the former part of June, we frequently hear, after nightfall, the sound you have just heard; from its regularity it is usually thought to resemble the whetting of a saw, and hence the bird from which it proceeds is called the Saw-whetter. I say 'the bird,' because though I could never find anyone who had seen it, I have little doubt that it is a bird. I have asked Mr. Titian Peale, the venerable Professor Nuttal, and other ornithologists of Philadelphia about it, but can obtain no information upon the subject of the author of the sound; it seems to be—

'Vox et præterea nihil.'

"Carver, in his amusing travels, mentions it as being heard near Lake Superior, naming it, if I recollect rightly, the Whet-saw. It may possibly be known, but I find nothing of it in Wilson or Bonaparte. Professor Nuttall was acquainted with the note, but told me plainly the bird was unknown. I conjecture it may be some of the herons or bitterns, or, possibly, from a passage in Bonaparte's Ornithology, the Evening Grosbeak (*Fringilla vespertina*). He says of that bird, 'their note is strange and peculiar; and it is only at twilight that they are heard crying in a singular strain. This mournful sound, uttered at such an unusual hour, strikes the traveller's ear, but the bird itself is seldom seen.' "

The sound is really produced by one of the smallest of the Owl family (*Cryptoglaux acadica*). Who it was that first made known the fact I do not know, but it is well established now.

I once saw a pair of these comical owls perched on the roadside fence, where a small brook crossed the way. I was in my waggon; and the confident yet inquisitive looks they gave me were very amusing. Probably, if I had attempted to leave the waggon, they would have flown quickly enough. I inferred that they had come to the brook in search of frogs.

Night-jars were plentiful in that part of the country in the summer. After night-fall they could be dimly seen overhead, hawking for moths and beetles. Their rapid movements, as they chased their prey, were not unlike those of the Tumbler Pigeon. And as they flew they uttered their plaintive call.

Once in a long while the scream of the lynx was heard in the night in that locality, as it was in the day time also. A little son of my next neighbor was passing through the woods one day when he was terrified by the cry of this animal. He started to run; and the lynx bounded along—all four feet in the air at once, after the manner of its progression—keeping a short distance on one side, and uttering repeatedly its startling cry, probably to call its mate. Whether the pair would have attacked the child I cannot say. Happily the sound of a woodman's axe was heard, and this guided the little fellow to safety and frightened the beast away.

In the early Spring the Frog Concert came off with great *eclat*, and was continued night after night. In it were heard the piccolo notes of the tree frog, the trombone of the bull frog, the cackling, croaking, rattling tattoo of the common frog, and now and then, like the jingle of the triangle, the "tr-r-r-r-ill" of a toad.

There are other sounds that break the stillness of the night—sounds produced by living creatures, but which can only by a figure of speech be termed the "voices" of the existences from which they come. To use the words of Ben Jonson:

> "The scaly beetles, with their habergeons,
> Do make a humming murmur as they fly."

Lachnosterna fusca, Fröhl, is the beetle that comes from the large white grub that is dug up so often in our gardens. Its shards, or elytra, are held erect while the true wings which are membraneous really bear the insect up, and by their vibrations produce the humming sound.

The impertinent "twang" of the mosquito is produced in like manner; and it is wonderful that wings so delicate and frail in appearance as those of the mosquito can be exercised with such rapidity as to produce so shrill a sound.

The antennæ of insects are supposed to serve instead of ears; and it may be that long and delicate antennæ with which many of the smaller kinds of Neuroptera are supplied were intended to catch the pulsations in the air caused by the rapid vibratory action of the minute wings of their compeers. Sounds we cannot hear are in all probability made known to the tiny companions of the creatures that produce them.

The wayfarer in the dusk of evening, who will pause near a patch of the Silk-Weed (*Asclepias cornuti*) in full blossom, will probably hear a distinct and continuous humming caused by the motion of the wings of the Sphinges and other moths, that flit from plant to plant, or hover over the blooms, and through their long and slender trunks, imbibe the nectar that Flora in her bounty has provided for them.

As the Summer advances, on nights when the weather is calm, the whole atmosphere seems to palpitate with the multitudinous calls, shrillings, chirrupings and sibillations of various orthopterous insects. The Naturalist with a good ear who will take Scudder for his guide,* and endeavor to distinguish between the notes of the different serenaders will have set himself an interesting task.

Day and night the Naturalist finds entertainment and food for reflection. It must be said though that the pursuit of Natural History is not always free from danger.

It is the custom, you know, for Entomologists to spread a mixture of molasses and rum upon the bolls of trees at nightfall, to attract Noctuids and then, at intervals, to visit the baits, carrying a dark lantern and the useful cyanide bottle.

A party of Montreal gentlemen were engaged in this "sugaring"—as it is called, in the outskirts of their city, when the sound of a pistol-shot broke the silence, and the *ping* of a bullet sounded unpleasantly near them. I need hardly say that their sugaring operations were abandoned for that night.

And this story reminds me of an experience of my own, in the long ago, when I was young and enthusiastic.

There was a wood about three miles from the town where I was living, and about the same distance from any other place—it was a lonely wood, I was accustomed to resort to it for Entomological researches. It was a grand hunting-ground; and I knew every part of it thoroughly. I was never disturbed nor molested there by anyone. I became very bold; and one night I determined to go there for sugaring purposes. I took a jar of prepared sweets, a dark lantern, and a supply of chip boxes; and I reached the wood about eleven o'clock. I had fairly entered and was preparing for work, when *bang! bang! bang!* broke upon my ear. I was startled you may well believe; but I understood the position in a moment; there were poachers in the wood shooting the pheasants at roost in the trees; and the men were but a few rods away. I said to myself, "If these men come upon me they will take me for a game-keeper; and if the game-keepers, hearing the guns, should hasten to the wood and find me here, they will take me for a poacher. In either case I shall fare badly." So I thought discretion the better part of valor, and made for my home as quickly and as quietly as I could.

It may be asked, of what interest to *Entomologists* are the Loon, the Fox, and the other creatures you have spoken of? To come to an answer you must follow a concatenation, such as that which connected the "priest all shaven and shorn" with "the malt that lay in the house that Jack built" and say:—

This is the Loon
That swallowed the Frog
That fed on the Gnats
That troubled the Folk
That lived in the house that Jack built

This is the Fox
That killed the Hen
That ate the Grigs
That leapt in the grass
That grew round the house that Jack built.

I remember a conversation that I had with the late Sir William Dawson. We were speaking of the Entomological Society of Ontario. He said. "I see that you have Geological, Ornithological, and Botanical Sections of your Society. We have regarded the studies that these pursue as of more importance than that which you make your chief consideration. The whole is greater than its part. But your proceedings show how one branch of Science intertwines with others."

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* (See "Songs of our Grasshoppers and Crickets," by Samuel H. Scudder, Twenty-third Report Ent. Soc. of Ontario, 1892, page 62).

I trust then that my reference to animals, birds and reptiles will not have been deemed inappropriate on this occasion.

Dr. Fletcher, in expressing the thanks of the audience for the interesting addresses that had been given them, drew attention to the wonderful success which had attended Mr. Kirkland's efforts. He had himself spent some time in Massachusetts during the early part of the summer and had seen what was being done. Mr. Kirkland was one of those all-round men who realized that each branch of knowledge had a close relationship with every other branch. He was not only a good entomologist, but also a good chemist, and he brought his chemical knowledge into practical use to aid his entomology. As a result he showed all North America the great value of arsenate of lead as an insecticide. Mr. Kirkland's task was the most extensive experiment in economic entomology that had ever been undertaken in the United States or in any other part of the world, but he is a man of great executive ability and is able to organize and control his great staff of 1,700 men and to use to the best advantage the large sums of money provided by the State Legislatures and Municipalities for the suppression of the Gypsy and Brown-tail Moths. We in Canada are deeply interested in the work inasmuch as the latter of these pests has invaded Nova Scotia and is producing consternation and dismay among many fruit-growers there.

SECOND DAY'S SESSION.

The President, Dr. Fletcher, took the chair at 10 o'clock in the Biological lecture room of the Ontario Agricultural College, Guelph. There were present during the day a large number of students in addition to the members of the Society. The first order of the day was the reading of the reports of the Council, the branches of the society at Montreal, Quebec, and Toronto, and of the Treasurer, Librarian, Curator and the Delegate to the Royal Society of Canada. This was followed by the election of officers for the ensuing year 1907-8, which resulted as shown on page 6. Dr. Fletcher was re-elected president, as were also the other officers with the exception of the delegate to the Royal Society, for which position Mr. Arthur Gibson, of Ottawa, was chosen in succession to Mr. A. F. Winn, of Montreal.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for 1906-7.

The forty-third annual meeting of the Society was held at its new home in the Ontario Agricultural College, Guelph, on the 10th and 11th of October, 1906, and was attended by many members from a distance and also by a large number of students of the College and Macdonald Institute.

The first afternoon was devoted to a conference on the Codling-worm, during which its whole life history was discussed, the value of parasites as a means of control was considered and many practical points were brought out by the various speakers who took part in it. This was followed by the

Reports on Insects of the year presented by the directors from their respective divisions of Ontario.

In the evening a public meeting was held in the Massey Hall which was nearly filled with an appreciative audience in spite of the inclemency of the weather caused by the first snowstorm of the season. After a hearty welcome from President Creelman, the President, Mr. John D. Evans, read his address, and was followed by a paper on "What the Entomological Society of Ontario can do for the Ontario Agricultural College," by Professor Lochhead, and a description of "A Canoe trip for Entomological Purposes through the Algonquin Park"—illustrated by a number of original lantern views—by Mr. Paul Hahn, of Toronto. The second day was occupied with the reading of reports from the branches and officers of the Society and a series of scientific and practical papers, all of which have been published in the annual volume.

This volume, the 37th Annual Report to the Legislature of Ontario, was published in May last and contained 120 pages, a portrait of the retiring President, Mr. John D. Evans, and six beautiful half-tone plates of Galls from a variety of trees. Besides the papers already referred to it included the following articles: "A Hunt for a Borer," by Mr. H. H. Lyman; "Two Insects affecting Red Clover and Seed Production," "Insect Galls of Ontario," "The Locust Mite," and "The Oyster-shell Bark Louse," by Mr. T. D. Jarvis; "Hemiptera," "In the tracks of *Nematus Erichsonii*" and "The Notodontidæ of the Province of Quebec," by Dr. Fyles; "Basswood, or Linden, Insects" and "The Bean Weevil," by Mr. A. Gibson; "Insects injurious to Ontario Crops in 1906" and "The Entomological Record, 1906," by Dr. Fletcher; "Injurious Insects of 1906 in Ontario," by Prof. Bethune.

A summer meeting of the Society—the first for a great many years—was held at the Ontario Agricultural College on the 4th and 5th of July. Through the kindness of President Creelman, the members from a distance were hospitably entertained in the College residence during their visit, and the ladies of the party were provided for in the Macdonald Hall. There were present also a number of Ontario teachers who were taking a summer course of Nature Study at the Macdonald Institute, and several students and members of the College staff. The first afternoon, the President, Dr. Fletcher, occupying the chair, papers were read by Mr. Lyman on the distinction between *Thecla calanus* and *Edwardsii;* Dr. Brodie on the life-history of a colony of Tent Caterpillars and the parasites infesting them; Dr. Fletcher on the control of the Gypsy and Brown-tail moths in Massachusetts by the importation of parasites from Europe, and Mr. C. W. Nash on "Balance in Nature." In the evening Dr. Henry Skinner, of Philadelphia, gave an interesting lecture on "Insects as Carriers of Disease;" Mr. Nash spoke upon "Instinct *vs.* Education," and Dr. Fletcher gave an instructive address on "Nature Study as a means of Education." The second day was devoted to an excursion to Puslinch Lake, about sixty taking part in it; after some hours spent in collecting entomological and botanical specimens, short addresses were given by the College staff and others upon the various objects of interest that had been brought in.

At a subsequent meeting of the Council, Mr. L. Caesar, O. A. College, was elected secretary for the remainder of the year in place of Mr. E. J. Zavitz, who resigned on account of the pressure of his duties in the Department of Forestry, which left him no time to devote to the business of the Society.

The Canadian Entomologist, the monthly magazine of the Society, has been regularly issued at the beginning of each month. The 38th annual volume was completed in December last, and ten numbers of the 39th volume have now been published. The volume for 1906 contains 425 pages and is illustrated with four full-page plates and 48 figures from original drawings. The contributors numbered 66 and included writers in Canada, the United States, Hawaiian Islands, England and Jamaica.

From October to the middle of May meetings of the Society were held in the Biological lecture-room on alternate Wednesday evenings, and occasionally more frequently. The members of the Wellington Field Naturalists' Club joined with those of the Society in the proceedings and thus a variety of biological subjects were discussed in addition to those of an entomological character. The attendance was very satisfactory, many Nature Study students and members of the third and fourth years being present at most of the meetings.

The reports from the branches of the Society at Montreal, Quebec, Toronto and British Columbia are very satisfactory, meetings having been regularly held and many papers read and discussed. The last named branch has published a quarterly Bulletin containing lists of British Columbia insects of various orders and many highly interesting notes and observations.

The newly organized Entomological Society of America held its first meeting in New York at the end of December last. It is gratifying to record that our Society was recognized by the election of Dr. Fletcher as first Vice-President, and Dr. Bethune as a member of the Executive Committee; both these gentlemen are also original Fellows of the new Society. In August the Society held its second meeting at Boston during the sessions of the Seventh International Congress of Zoologists; Dr. William Saunders, of Ottawa, and Mr. H. H. Lyman, of Montreal, two of our members of long standing, were elected Fellows, and Dr. Bethune, one of the two representatives of the Society on the Council of the American Association for the Advancement of Science.

JAMES FLETCHER, President.

ANNUAL REPORT OF THE MONTREAL BRANCH.

The 284th regular, and 34th annual meeting of the Montreal Branch was held on May 11th, at the residence of Mr. Geo. A. Moore, 209 Prince Arthur Street.

The following were present:—Mr. G. A. Moore in the chair; Messrs. H. H. Lyman, G. Chagnon, E. C. Barwick, E. Denny, A. E. Norris, E. Kollmar, G. R. Southee, C. W. Sach, A. F. Winn.

The Secretary read the following report of the Council:

During the year, meetings have been held monthly, excepting in July, August and September, the attendance averaging seven members. Four new members have been added to our roll, Messrs. M. W. Davis, C. S. Fosbery, E. Kollmar, C. W. Sach.

A field day was held on May 24th at St. Hilaire, and several members attended the outing of the Natural History Society at St. Gabriel de Brandon.

The papers read at the meeting were:

"Reflections and Suggestions," Henry H. Lyman.

"St. Hilaire, May 24, 1906," G. A. Moore.

"Notes on Coleoptera collected by Mr. Moore at Como, Que.," G. Chagnon.

"Collecting Catocalae in the day-time," E. Denny.

"Collecting Hemiptera at Como," G. A. Moore.

"The Genus Chrysbothris, with notes on Canadian Species," G. Chagnon.

"Clastoptera," G. A. Moore.

"Thecla calanus and T. Edwardsii," Henry H. Lyman.

Specimens of the following genera of moths were brought together at the various meetings for comparison and study:—Xylina, Acronycta, Datana, Hadena, Feltia and Heliophila, resulting in a better knowlege of these groups, and the correction of several errors in identification.

Your Council would again urge the members to write short notes for the meetings, and also to prepare for the fall meetings, reviews of the summer's work in the field, experiences in breeding species, studies of habits, etc.

Additions to our collection of specimens, books and photographs should not be forgotten.

St. Madeleine, Que., has been suggested as a locality suited for the field day on May 24th.

Respectfully submitted,
(Signed) GEO. A. MOORE,
President.

The treasurer's report showed a balance on hand of $59.40. The reports of the curator and librarian were also submitted and adopted.

The following officers were elected:—President, Geo. A. Moore; Vice-President, E. C. Barwick; Sec.-Treasurer, A. F. Winn; Librarian and Curator, L. Gibb; Council, G. Chagnon, H. H. Lyman, G. R. Southee, E. Denny.

REPORT OF THE QUEBEC BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Quebec Branch of the Entomological Society of Ontario has pursued its useful course for a period of ten years.

We have had to mourn the demise of some of our members and to bid adieu to others who have moved to distant localities, but additions to our membership have from time to time encouraged us.

The authorities of Morrin College still allow the Branch to hold its meetings in that institution—a privilege that is highly appreciated by the members.

The past season has been, for the most part, an unfavorable one for entomologists, on account of the frequent rains, but much good work in collecting was done by our curator, Mr. A. R. M. Boulton. Such fine moths as *Ceratomia amyntor*, Geyer, *C. undulosa*, Walker, *Sthenopis argenteo-maculatus*, Harris, being taken by him.

Mr. Boulton also, on one of his excursions, discovered a batch of Hemaris larvæ, feeding upon a solitary bush of *Viburnum opulus*, Montmorency. The larvæ are true Sphinges in form and attitude; but they lack the transverse side-lines that other Sphinges have, and they do not bury themselves in the ground when full fed, but spin a slight cocoon among leaves above ground.

Another interesting batch of larvæ was brought from Miranda, P. Q., by Miss Johnson, one of our members. It was one of *Anisota Senatoria*, S. & A., a species that has not hitherto been taken at Quebec.

A case of valuable specimens from California was presented by Miss Freeman.

The Branch now numbers 28 members.

During the year papers were read by the President on *Hemiptera*, on the *Flora* and *Fauna* of the Province of Quebec, on "Voices of the Night," on

Insects injurious to Gardens and Fields, on the Asparagus Beetle (*Crioceris asparagi*) and on the Habits of Insects.

The members were hospitably entertained at the houses of the President and Mr. J. H. Simmons, and also by Mr. and Mrs. Geggie, at "Darnoc," Beauport, where a very enjoyable field-day was held.

At the annual meeting held on the 9th October, 1907, the officers for the coming year were elected as follows:—President, Rev. Dr. Fyles; Vice-President, Mrs. Richard Turner; Secretary-Treasurer, Lt.-Col. Crawford Lindsay; Council, Hon. Richard Turner, J. H. Simmons, Esq., Miss Bickell, Miss Freeman, Miss Hedge.

CRAWFORD LINDSAY,
Sec.-Treasurer.

REPORT OF THE TORONTO BRANCH, 1906-7.

The eleventh annual meeting of the Toronto Branch of the Entomological Society of Ontario was held in the Provincial Museum on Tuesday, June 18, 1907.

The President, Dr. Brodie, was in the chair and the following members were present:

Dr. Brodie, Mr. Williams, Mr. Webb, Miss Blackmore, and several visitors.

The Secretary read the following report:

We have pleasure in announcing a very successful and profitable year's work. Our membership roll is slightly increased, although one or two have dropped out.

In all we have had eight meetings and the average attendance of members has been nine. At all the meetings we have also had a number of visitors.

The papers read during the session have been instructive and entertaining, and some have presented material entirely new; at least to most of the members. Not a few have been illustrated by specimens, charts, and models, which added greatly to the value of the lectures.

LIST OF PAPERS, 1906-7.

1. Snout Beetles, Mr. Cosens.
2. Contributions of the 19th Century to the World's Knowledge, Dr. Brodie.
3. Nuptial Dance of some Insects, Dr. Brodie.
4. A week at Niagara, Mr. Williams.
5. An Early Writer on Entomology, Mr. Cosens.
6. Ancestors of Insects, Dr. Walker.
7. Insect Mimicry, Dr. Brodie.

Publications have been received from Ottawa and Washington, from the Ohio and Connecticut Experiment Stations, and from New York State Museum at Albany; and a donation of some Toronto beetles from Mr. Arthur Reston.

The Treasurer reported a balance in hand of $5.55.

The following officers were elected: President, Dr. Brodie; Vice-President, Dr. Walker; Secretary-Treasurer, Miss Blackmore; Librarian and Curator, Mr. Williams; Council, Mr. Hahn, Mr. Webb, Dr. Abbott, Mr. Ivy.

An excursion was made to Niagara Glen on June 8th. About 15 people went, and some very interesting collections were made, especially of shells.

E. BLACKMORE,
Secretary.

TREASURER'S REPORT.

For the Year ending August 31st, 1907.

Receipts.		*Expenditure.*	
Balance on hand Sept. 1, 1906.	$ 523 75	Officers' Salaries	$225 00
Members' fees	399 38	Annual Report	206 75
Legislative Grant	1,000 00	Printing Account	909 08
Sales of pins, cork, etc.	46 01	Expense account, postage, etc.	72 76
Sales of Can. Entomologist	203 81	Purchase of pins, cork, etc.	17 31
Advertising	16 00	Library	12 60
Bank Interest	6 66	Insurance of library and collections	26 00
Refund for rent in London	10 00	Expenses of annual meeting.	95 38
		Balance	640 73
	$2,205 61		$2,205 61

S. B. McCready,
Treasurer.

Examined and found correct this 25th day of October, 1907.
(Signed) J. W. Crow *and* B. Barlow, *Auditors.*

REPORT OF LIBRARIAN.

During the year ending August 31st, 1907, there have been added to the Library twenty-two bound volumes and a large number of periodicals, bulletins and pamphlets; a considerable portion of these will be bound up into permanent volumes during the next few months. Among the new books may be mentioned Folsom's Entomology, with reference to its Biological and Economic aspects; Sir George Hampson's Catalogue of the Noctuidæ in the British Museum, vol. vi.; and Barker's Anatomical Terminology.

48 volumes have been taken out by members during the year and the library has also been made use of for reference and consultation.

Respectfully submitted,
Charles J. S. Bethune,
Librarian.

CURATOR'S REPORT.

During the past year the Curator's work has consisted chiefly in the general care of the Society's collections, the inspecting of the cabinets for pests from time to time, and the placing in the cases of new specimens contributed by members of the Society. In addition to the general work the collections have been gone over and lists prepared of species particularly wanted to fill gaps and replace old and imperfect specimens in the Society's cabinets. These lists will be furnished to members of the Society and it is hoped that all members having spare specimens of the listed species will forward them to the Curator, with date and locality labels attached, in order that the Society's collection may be made as complete and perfect as possible.

Since the last report the following contributions have been made to the collections and our sincerest thanks are due to the generous contributors:

8 specimens of Lepidoptera by Dr. Fletcher, Ottawa; 2 specimens of Coleoptera by J. D. Evans, Trenton, Ont.; 2 specimens of Lepidoptera by C. H. Young, Ottawa; a large collection of Canadian and exotic Coleoptera by Henry S. Saunders, Toronto; 2 specimens of Lepidoptera by J. H. Cook, Albany, N.Y.; 2 specimens of Coleoptera by E. J. Zavitz, O.A.C., Guelph; over 200 species of Lepidoptera by F. H. Wolley Dod, Millarville, Alberta; 50 specimens of Lepidoptera by Charles R. Eby, Washington, and an extensive collection of Insect Galls by T. D. Jarvis, O.A.C., Guelph.

Since the Society's cabinets were installed in the Biological Building at the College, the collections have been constantly accessible to visitors and have been made great use of by the members of the Entomological Department to illustrate lectures and as an aid in the determination of the species submitted to the Department for identification. They have also been a great help to Third and Fourth Year students in naming specimens in the collections which they are requested to make as a part of their work in Entomology.

Respectfully submitted,
J. E. HOWITT, *Curator.*

REPORT TO THE ROYAL SOCIETY OF CANADA.

The following is the report to the Royal Society of Canada from the Entomological Society of Ontario, through Mr. A. F. Winn, Delegate.

The most important event in our Society, during the past year, was the transferring of headquarters to Guelph from London, where they were established in 1872. This change was found necessary owing to the dying out of interest in Entomology in London, and Guelph was selected as being the place most suitable to secure the best interests of the Society, as well as being in accordance with the wishes of the Ontario Department of Agriculture. Aside from the fact that the Society already had a flourishing branch there with a large list of members, at the Agricultural College attendance at lectures in Entomology is compulsory for students in the second and third years, while in the fourth year some specialize in the subject and naturally become active members of the Society and thus ensure a continuity of work and interest.

The collections of books and specimens were moved without any damage whatever. The cabinets of specimens are now conveniently arranged for reference in a portion of the College Museum set aside solely for them. The books and pamphlets, which form a valuable collection of over 1,800 volumes are in a series of stacks in the fireproof Massey Hall Library Building, and are kept entirely distinct from the general library of the College.

Our magazine, "The Canadian Entomologist," has been issued regularly early every month. The 38th volume comprises 425 pages with four full page plates, and 48 figures in the text. The contributors number 66, spread not only through Canada but the whole of North America, and a few residing in England, the West Indies, and the Hawaiian Islands. Two new genera of insects are described and one hundred and fifty new species as well as a number of varieties.

Life histories of several species of insects are recorded, including among the Lepidoptera. *Barathra curialis* by Dr. Fletcher and Mr. A. Gibson; *Incisalia irus* and *I. augustus* by Mr. John H. Cook; Among the Hemiptera, Mr. J. R. de la Torre Bueno gives the first full account of the Water-bugs *Belostoma fluminea* and *Ranatra quadridentata.*

The series of articles on Practical and Popular Entomology has been continued and the papers published last year are: The Dragon-flies and Damsel-flies by Prof. Franklin Sherman, Jr.; Household Insects by Prof. Wm. Lochhead; Winter Retreats of Insects by Rev. Dr. Fyles; Some Beetles of early May by Rev. Dr. Bethune; Work for June Caterpillar hunting by Mr. A. Gibson; Mites affecting Farm Homesteads by Mr. T. D. Jarvis; The Oyster-shell Bark-louse by Mr. T. D. Jarvis; The Bean Weevil by Mr. A. Gibson; The Locust Mite by Mr. T. D. Jarvis.

Articles descriptive of new species of Lepidoptera are by Mr. A. G. Weeks, Jr.; Mr. August Busck, Mr. A. Cosens, Rev. G. W. Taylor, Mr. John A. Grossbeck. Coleoptera by Mr. Chas. Schaeffer, and Mr. H. C. Fall. Hemiptera by Dr. E. Bergroth. Diptera by Miss C. S. Ludlow, Dr. M. Grabham, Hon. N. Chas. Rothschild. Hymenoptera by Mr. J. C. Crawford, Mr. Myron H. Swenk and Prof. T. D. A. Cockerell. Orthoptera by Mr. A. N. Caudell. Coccidæ by Mr. R. S. Woglum.

Papers on Classification include Mr. G. W. Kirkaldy's Catalogue of Aphidæ; The Classification of Culicidæ by Prof. S. W. Williston; The Perlidæ by Mr. Nathan Banks; Synopsis of Bees of Oregon, Washington and British Columbia, by Mr. H. L. Viereck and associates; Notes on the classification of the superfamily Miroidæ by Mr. G. W. Kirkaldy.

The following are among the papers on miscellaneous topics: A North American Entomologists' Union by Mr. H. H. Lyman; Records of Orthoptera from the Canadian North-west by Dr. E. M. Walker; The Burrows of Cicindela by Mr. W. T. Davis; A fossil Water-bug by Prof. T. D. A. Cockerell; The snow-fly, Chionea valga by Mr. C. N. Ainslie; Notes on Hemiptera taken near Lake Temagami by Mr. E. P. Van Duzee; Geometrid Notes by Mr. Richard F. Pearsall.

Space has been devoted to records of the meetings of the Branches at Toronto, Guelph, Montreal, Quebec and Vancouver which are all in flourishing condition. The appearance of the new books and pamphlets on Entomological subjects has been promptly chronicled.

The Society has, as usual, furnished the Ontario Department of Agriculture with an account of its annual meeting, and a number of articles of popular and economic nature. These have just been published under the well-known title of The Annual Report of the Entomological Society of Ontario. Report 37 contains 120 pages illustrated by 6 beautiful half-tone plates of insect galls found on plants of various kinds, 36 cuts in the text and a portrait of our last year's President, Mr. John D. Evans. Among the papers may be mentioned: Parasitism of Carpocapsa pomonella, (the Codling Moth), by Dr. Brodie; A Hunt for a Borer by Mr. H. H. Lyman; Insect Galls of Ontario, by Mr. T. D. Jarvis; Hemiptera, by Rev. Dr. Fyles; Injurious Insects of 1906 in Ontario, by Rev. Dr. Bethune; Basswood, or Linden, Insects, by Mr. A. Gibson; Insects Injurious to Ontario Crops in 1906, by Dr. James Fletcher.

Dr. Fletcher's Entomological Record for 1906 requires 19 pages, is full of notes on the occurrence and distribution of the rarer species of Canadian insects, and becomes each year more valuable.

In conclusion your Delegate drew attention to the fact that the much dreaded Brown-tail Moth had established itself in Nova Scotia and hoped that immediate and thorough action would be taken to rid the country of an insect, which, if allowed to breed without check would prove disastrous to the far famed apple orchards of the Annapolis Valley.

During the remainder of the morning and in the afternoon the following papers were read and briefly discussed: "Further notes on Hepialus Thule at Montreal" by Mr. H. H. Lyman, and "Notes on Collecting Sthenopis (Hepialus) Thule at Montreal" by Mr. E. Denny. (These two papers are published in the *Canadian Entomologist* for December 1907). "The Two-winged Flies of the Province of Quebec" by the Rev. Dr. Fyles; "The Scale Insects of Ontario," illustrated by a large number of specimens, by Mr. T. D. Jarvis; "An Unusual Outbreak of Halisidota Caterpillars" by Mr. Arthur Gibson; "A Remarkable Outbreak of the Variegated Cut-worm" by Prof. Bethune and Mr. L. Caesar; "Insects Injurious to Ontario Crops in 1907" by Dr. James Fletcher; "Insects of the Season, 1907" by Prof. Bethune; "The Entomological Record for 1907" by Dr. Fletcher. The session was brought to a close with the Presidential Address of Dr. Fletcher on "The Entomological Outlook in Canada." These papers will be found in subsequent pages of this report.

In the evening an illustrated lantern lecture was given in Massey Hall by Dr. E. M. Walker of Toronto, on collecting and rearing Dragon-flies, after which votes of thanks were accorded to President Creelman, the local officers of the Society and the lecturers. The meeting then adjourned.

COLLECTING AND REARING DRAGON-FLIES AT THE GEORGIAN BAY BIOLOGICAL STATION.

By E. M. Walker, M.D., Toronto.

During the summer of 1907, I spent two months at the Freshwater Biological Station, Georgian Bay, Ont., and there had good opportunities for studying the aquatic insect life, especially the Dragon-flies, which were particularly abundant both in species and individuals and to which a considerable amount of time was devoted.

In this work I was ably assisted by W. J. Fraser, who also continued the work for about three weeks after I left, and to whose keen observation and enthusiasm much of the credit of the work is due.

The Georgian Bay Biological Station, whose site is on one of the numerous islands about the entrance to Go Home Bay affords the entomologist almost ideal conditions for the study of aquatic insect life, combining as it does the advantages of a laboratory equipment with those of extremely varied natural surroundings in which a great many different kinds of aquatic environments are represented.

In addition to the laboratory building, the Station is provided with a dwelling house for the use of its working staff, a store-house for material, a tank and pumping engine to supply the laboratory with running water and a boathouse supplied with several small boats, fishing-nets and other collecting apparatus. The laboratory building is situated close to the water's edge and has an ample floor space of 20 x 40 ft., divided into a large general laboratory and 4 small rooms, used respectively as photographic, chemical, glassware and private rooms. The laboratory affords working space for 12 students and in its centre is a long aquarium table supplied with running water from the tank so that it is possible to keep under observation animals, such as fish-embryos or the inhabitants of rapid streams which soon die or at least do not thrive in an ordinary aquarium.

In view of its connection with the Department of Marine and Fisheries the work of the Station is primarily concerned with problems relating to pisciculture, such as the spawning habits of the various food fishes and the natural history of the smaller forms of life upon which they feed. In this connection a knowledge of the life histories of the aquatic insects is of considerable importance, forming as they do a large part of the food of some of the fish. The food of the brook-trout for example as Prof. Needham has shown (Aquatic Insects in New York State, Bulletin 68, N.Y. State Museum) consists almost entirely of certain aquatic insect larvæ, particularly those of a certain Chironomid fly, while other small dipterous larvæ, caddis worms, etc., contribute a considerable proportion.

At Go Home Bay we frequently found the stomachs of the common sucker filled almost exclusively with the full-grown nymphs of the large May-fly (*Hexagenia bilineata*) which breeds in enormous numbers in the bays and channels in that locality, and many other instances could be given of insects forming an important part of the food of fish.

A considerable portion of the two months which I spent at the Station was accordingly devoted to this branch of the work, most attention having been given to the Dragon-flies, as the group with which I was most familiar and one which was very abundantly represented there.

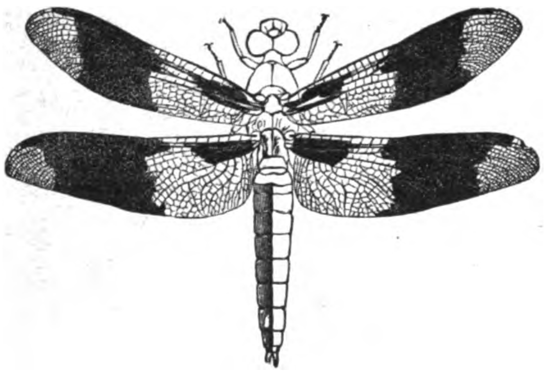


Fig. 4. Dragon-fly.

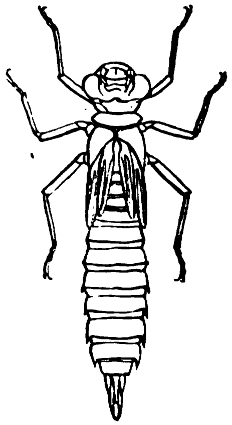


Fig. 5. Nymph.

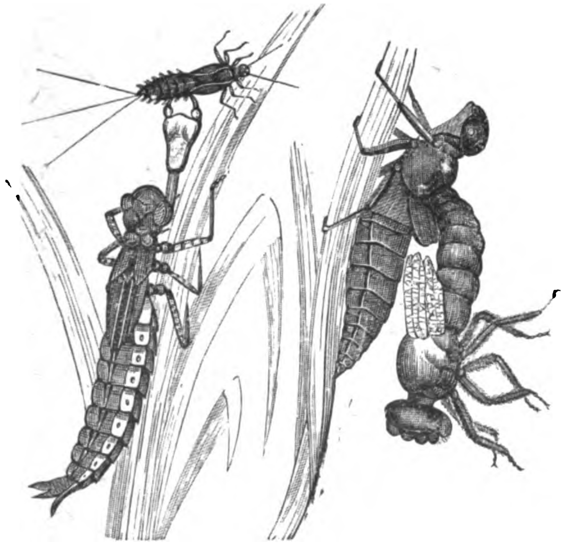


Fig. 6. Larva seizing its prey and the Dragon-fly emerging from the Nymph.

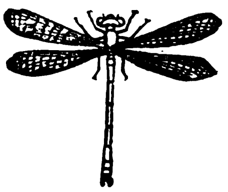


Fig. 7. Damsel-fly.

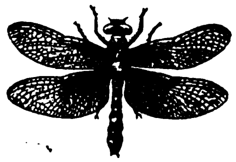


Fig. 8. Nannothemis bella.

Life-History of Dragon-flies.

All Dragon-flies (Fig. 4.) are aquatic in their early stages and all inhabit fresh or occasionally brackish water. The eggs are deposited by the female upon various aquatic plants or freely upon the surface of the water, either singly or in clusters of varying size, sometimes enveloped in a gelatinous mass like those of snails or frogs. On hatching the young nymphs at once begin the active predaceous life which is characteristic of the whole tribe. They feed upon all kinds of small aquatic life, such as other aquatic insects, snails, tadpoles, or even small fish, which they grasp by means of a pair of hooks at the end of the enormously developed labium. This structure when at rest is folded under the head, concealing the mouth-parts like a mask, but when a small insect or other suitable animal chances to pass near by, it is suddenly thrust out with lightning speed and the victim drawn back within reach of the powerful mandibles (Fig. 6.). The length of the nymph's life varies greatly in different species, sometimes 3 or 4 years being required to reach maturity. When ready for transformation the nymph crawls out upon some suitable support such as a rock, reed or log, the choice of this support and its distance from the water's edge varying in different species (Fig. 6). In a few minutes the thorax begins to bulge, the skin splits along the median line and across the head, and the insect gradually emerges, the thorax appearing first, then the head, wings, legs and finally the abdomen; the latter is at first comparatively short and stout but rapidly elongates and at the same time the wings expand. The coloration is at first very pale and indefinite and it generally requires at least a day before it is fully mature.

Transformation usually takes place early in the morning and hence this is an excellent time for collecting material, for one can often get the imagoes of good species, together with the exuviæ of their nymphs, which retain the form of the latter perfectly and are therefore invaluable as specimens. The imagoes with their exuviæ are best collected in paper bags, in which they can be kept until the colors have matured.

Nymphs (Fig. 5.) of different species inhabit different aquatic environments and all such should be thoroughly searched. The best apparatus for general collecting is the sieve-net devised by Prof. Needham (Bull. 39, U.S.N.M.). This is a deep galvanized iron tray with a bottom of galvanized wire-screen. It can be made like a rake as a combination of net and sieve.

Most nymphs are easily reared in ordinary aquaria though some require running water. We used large, glass jars, covering the top when necessary with cheese cloth. A quantity of the rubbish in which the nymphs naturally live should be placed in the water and a few branches or boards for them to crawl out upon at the time of transformation. A sufficient quantity of aquatic plants must be used to keep the water fresh and the rubbish containing the nymph's food changed once a week.

As already observed the natural conditions which obtain in the vicinity of Go Home Bay are very well adapted to the study of aquatic insect life. Lying at the mouth of the Go Home River, one of the outlets of the Muskoka Lake system, it is within easy reach of a variety of different kinds of aquatic environment, representing all the transitions from the open lake to the sheltered river system. There are the rocky islands and reefs in the open lake, wind-swept and wave-tossed and either wholly barren of vegetation or affording but a scanty sustenance to a few stunted pines, junipers and other hardy plants in the crevices of the rocks, while further inland there are the deep quiet waters of the bay with numerous wooded islands, and finally the moving water of the Go Home River. Then at many points along the irregular shores of the mainland and the larger islands, shallow inlets with sandy or gravelly bottoms and a luxuriant aquatic and shore vegetation support a widely different fauna from that of the more exposed parts, while finally there are numerous small inland lakes, which again present conditions quite distinct from any of those already mentioned. Their shores are sometimes rocky and bare in places but are for the most part swampy; floating sphagnum bogs being a special characteristic of the margins of these lakes. These are often gems of natural beauty and are of great interest to both zoologists and botanists on account of the many rare and interesting forms, mostly of a boreal character, which are met with here.

The first collecting trip after my arrival at the Station was made on June 16th to one of the larger of these enclosed lakes. The black flies were so tormenting that collecting, especially in a sheltered spot like this, was by no means a pleasure and even in the more exposed islands their numbers were sufficient to cause us considerable annoyance. But few dragon-flies were as yet abroad and these had for the most part not yet attained their mature coloration. *Libellula exusta*, Say., was the most abundant and continued to be so throughout a large part of the season. It is not common with us at Toronto but here, particularly during July, was extraordinarly numerous everywhere in the woods, but especially about these lakes and in the shallow swampy inlets. The female is inconspicuously colored but the males have their bodies covered in part by a bluish-white bloom which renders them very conspicuous when chasing each other over the water or resting on the rocks and logs. We found the nymphs of next year's brood in large numbers in the red-rotten vegetation at the bottoms of these lakes and the exuviae where commonly found adhering to the sedge and grass near the water's edge.

Another Dragon-fly of very different structure and appearance but frequenting the same sort of waters, is *Gomphus spicatus*, Selys. This was also met with on our first trip in considerable numbers and continued to emerge for some days afterwards. It belongs to a group whose nymphs are burrowers and in accordance with such habits are more or less flat with legs adapted for digging. They live in the silt at the bottom of lakes, ponds and streams, the tip of the elongated abdomen being held above the surface for breathing purposes. The imagoes, like most species of the genus, are dark brown with yellow bands and spots, rather small, widely separated eyes and a more or less club-shaped abdomen in the male. They also have the characteristic Gomphine flight, which though swift is generally very short, the insect constantly alighting, usually upon flat ground, seldom perching upon twigs after the manner of Libellulines. *G. spicatus* became very abundant at Go Home but like most of its congeners it is comparatively short-lived and by the middle of July has almost disappeared.

A third species of which only freshly emerged examples were taken on this date was *Leucorhinia frigida*, Hag., a small Libelluline of distinctly northern distribution which is quite absent from the fauna of southern Ontario. It became one of the most abundant Dragon-flies at Go Home Bay and was especially characteristic of the small lakes, while our common southern species *L. intacta*, Hag., was but rarely met with. Its nymphs had never been found before, but we obtained them in large numbers and reared them without difficulty.

Four other species were also taken on this date, two common little Damsel-flies or Agrionidae, the little blue *Enallagma Hageni* (Walsh) and the wide-spread *Ischnura verticalis* (Say), that familiar little green and black species with the blue-tipped abdomen; and two species of *Tetragoneuria,* the common *semiaquea* (Burm.), and the larger and more northern *spinigera* (Selys.). The former is common everywhere in southern Ontario, but I have never seen them in anything like such large numbers as they appeared at Go Home Bay, especially about the last week in June, when on hot still days they positively swarmed in favorable spots. They breed most abundantly in the little marshy coves along the shore, and here the exuviae were sometimes so numerous that a single reed or grass stem would bear half a dozen of them.

Next day we went to the 'Chute,' a waterfall a short distance up the river. Here two other dragon-flies not often taken by the ordinary collector were found. These were *Didymops transversa* (Say), and *Basiaeschna janata* (Say.). The former is a brown insect with clear wings, the abdomen transversely banded with pale yellow and distinctly club-shaped in the male, while the latter is closely related to the various members of the genus Aeschna, those large dragon-flies with blue-spotted bodies that are so common in late summer. Both of these forms have the habit of following the shores of the lakes and streams in a regular beat so that if one stations one's self at some point along their course, one has a fair chance of capturing them as they pass by sweeping the net at them from behind.

The nymph *transversa* is a very curious spider-like creature with a round abdomen and long sprawling legs which clambers about the rocks along the shores of the bay and when ready to transform usually crawls several yards at least from the water's edge. The only other Canadian species allied to it also appeared at Go Home, but later in the season, namely about July 4, when *Didymops* had already disappeared. The nymph of this species (*Macromia Illinoiensis,* Walsh) closely resembles that of *Didymops* but the imago is a much larger and finer insect, a splendid dragon-fly, black with a conspicuous yellow spot on the upper side of the abdomen and the sides of the thorax metallic green with an oblique yellow stripe. It has also superb aerial powers and great patience and determination is required to get many specimens.

Towards the end of June new dragon-flies were constantly making their appearance. On the Station Island, which lies partly well out toward the open bay, three species of Gomphus appeared about this time, *G. sordidus,* Selys., a large species, much resembling *spicatus* but quite different in habitat, appeared in great numbers, the nymphs crawling out from among the boulders along the shore and transforming upon the rocks close to the water's edge. In a few days the islands were covered with them but they were very short-lived, the great majority having disappeared by the first week in July. A few specimens also of *G. brevis* (Selys.), a short thick-set form, appeared about the same time but were found to be more characteristic of the rapids of the river, while a few days after the first *sordidus* emerged, *G. exilis* (Selys.), appeared, soon increasing greatly in number and showing a much wider choice of habitat than either of the others. While *spicatus* and *sordidus* were only accidentally found together, *exilis* was commonly associated with both of them. The food of these Gomphines seems to consist chiefly of May-flies, which are so abundant during their season of flight and which likewise disappear so suddenly.

More interesting than any of these, however, was the discovery of *Neurocordulia yamaskanensis* (Prov.), a species originally described from Mount Yamaska, Quebec, by L'Abbe Provancher, but which has been taken by very few collectors since then. Several years ago I obtained a number of nymphs and exuviae, of a kind unfamiliar to me, in Algonquin

Park, which were referred by supposition to this insect, as they clearly belonged to the same genus as *N. obsoleta* (Say.), the only other regional species and whose nymph was already known. This summer I had the good fortune to come upon the same kind of exuviae upon the timbers of the wharf at Go Home, where they had evidently emerged from water of considerable depth, 5 or 6 feet at least. Further search revealed others on the steeper parts of the rocky shores and on June 28th a special hunt for the emerging imagoes was made in the early morning. After protracted search, when we had almost come to the conclusion that their time for transformation was over, one was at last found in a wide crevice accompanied by its exuviae, and on subsequent occasions several more were obtained.

No imagoes could be found on the wing, however, and it became a subject of conjecture to us what became of them. One evening, however, some time after sunset, Mr. Fraser made the discovery that they were flying about the island in pursuit of May flies. Since then we took them repeatedly at almost the same hour, but at no time during the day were they ever seen upon the wing, except when started from a bush or tree where they were resting. This is the only case I know of a strictly crepuscular dragon-fly though several diurnal species, such as the Aeschnas, are known to fly until dusk.

Several other forms belonging to this same group of Cordulinae were met with but the only ones which occurred in large numbers besides the *Tetragoneurias* already alluded to, were the dainty and beautiful little *Dorocordulia libera*, (Selys.) and the large and striking *Epicordulia princeps*, (Hag.). The former with its delicate form and slender waist, its vivid emerald green eyes and dark metallic green body is one of our most exquisite dragon-flies. Its nymph is an inhabitant of the swampy inlets and boggy margins of the enclosed lakes, and here the imagoes may be found coursing up and down over the water or the bog, with the abdomen tilted up in a peculiar way, or sunning themselves upon the leaves along the shore.

Epicordulia princeps, (Hag.) is a species of more southern distribution and hence more often seen in collections. It is peculiar among Cordulines in having the wings spotted after the manner of some of the common Libellulae, but is readily distinguished from these on the wing for it is a much more restless insect, flying ceaselessly over the larger bodies of water often at considerable heights, but also common enough in the rocky open woods some distance from the shore. It was a very characteristic species about Go Home Bay from the last week in June until about the middle of August.

The largest and most striking of all the dragon-flies of the region, however, has not yet been mentioned. This is a great black and greenish-yellow Gomphine, *Hagenius brevistylus*, (Selys.) which suddenly appeared on the Station island and elsewhere in considerable numbers. Its great size, striking coloration and the peculiar way in which the abdomen is curved downward in flight renders it a formidable-looking insect on the wing, while its nymph is a most gorgeous creature very different in appearance from other Gomphines. It is a large flat brown insect with a nearly circular abdomen looking more like a gigantic bed-bug than anything else. They live among the roots and debris along the lower and more sheltered parts of the shore, always, however, where there is considerable wave-action or current. The few nymphs we found before their time for transformation began died in confinement, the water in which they were kept not having been sufficiently well aërated.

Numerous other dragon-flies were taken and the nature of their breeding places more or less definitely determined, but time does not permit me to mention more than a few of these.

The greatest rarity was *Nasiaeschna pentacantha* (Ram.) of which probably less than twenty specimens exist in collections, although it is distributed as far south as Texas and has been known a long time. Last year Mr. Fraser obtained three specimens of its peculiar nymph near Bala, Muskoka. This is a large sluggish dark-brown creature of apparently similar habits to those of *Hagenius* but entirely different in appearance. This summer I accidently found a nymph clinging to my paddle while passing through a short channel which leads into one of the small lakes. Further search for nymphs proved fruitless but a few days afterwards a few imagoes were seen on the wing over a marsh on the border of the same lake, but were too wary to be netted. About a week later, however, I chanced upon a similar spot in another locality and managed to net a fine male, and this was the only one taken as the season was apparently about over.

Another somewhat rare species and a very odd and interesting little one is *Nannothemis bella* (Uhl.) Fig. 8. This is a very tiny dragon-fly, though it belongs to the Libellulidae which are mostly large forms, whereas all the rest of our very small species belong to the Agrionidae or Damsel-flies. The male, which is at first perfectly black, very soon becomes covered with a bluish dust, while the female is black with transverse bands of yellow. It was only found in two places but at one of these it was exceedingly abundant. This was a small floating sphagnum bog occupying one corner, of an enclosed lake and having an area of scarcely 50 square yards. Here they were flying about among the grass and bog plants close to the ground and when perching had the peculiar habit of folding the wings downwards on each side of the stalk which formed their support. This spot was a veritable little garden of orchids and other interesting plants. Over the sphagnum moss the cranberry vines trailed in the greatest profusion, while pitcher-plants, sundews of two kinds, the delicate rose-colored orchids, *Pogonia ophioglossoides* and *Limodorum tuberosum*, and the tufts of white cotton-grass were a most charming spectacle. It is among the roots of the cranberry-vines and sphagnum that the nymphs of *Nannothemis* live, these being well immersed in water. We could not find any, however, and two exuviae were the only reward of a most careful search. This bog and others of the same kind were the home of many other dragon-flies, but I shall make mention of only two or three of the Damsel-flies or Agrionidae (Fig. 7), a large group which I have as yet scarcely alluded to. Some 18 species were taken in the vicinity of Go Home Bay, two of which were new to Canada. These Agrionids are the small delicate forms that flit about in such large numbers among the grass and sedge about the margins of lakes and streams. One of the smallest of our species *Nehallennia gracilis*, Morse, and a new addition to the Canadian fauna, we found in vast numbers in every sphagnum bog. It is an exceedingly delicate little bronze-green insect, the under parts yellowish-green and the end of the abdomen beautifully tipped with pale blue, and very closely resembles the common species *N. irene*, which, however, has different haunts, preferring the shallow marshy inlets of the bay to the bogs of the small lakes.

The most familiar members of this group, however, are the beautiful little azure-blue *Enallagmas* and the larger, dark metallic-green forms with broad black or banded wings belonging to the genus *Calopteryx*. *Enallagma* was abundantly represented by 8 species, but *Calopteryx* of which *C. maculata* is familiar to every collector was exceedingly rare, it being a frequenter of woodland streams of which there were very few in the district.

Lestes is another large genus of this group and was conspicuously represented at Go Home, the large and graceful *L. vigilax* being particularly numerous in all marshy places. These forms are slender, graceful insects, generally bronze in color and are easily recognized in the field by the listless way they have of resting upon a grass stem or reed with the wings half spread. Other Agrionids keep their wings folded together over the back, while in the rest of the dragon-flies they are held in a horizontal position.

These *Lestes* are among the later dragon-flies to appear and are common until well on in September, when almost the only other survivors of the group are the *Aeschnas* and the various species of *Sympetrum,* those hardy little red fellows which are so abundant in late summer and fall. The dragon-fly season, in fact, begins to wane before the end of July, though a host of forms are still abroad in August and several species do not appear until the month has begun. We have, however, dealt with a sufficient number to indicate the nature of this part of our summer's work at the station and the character of the fauna in that region. Fifty-eight species were taken and the nymphs or nymph exuviae of nearly half that number, and it is to be hoped that the work will be continued year by year until the life histories are known not only of the dragon-flies but of all the aquatic insects of the region.

A PRELIMINARY LIST OF THE SCALE INSECTS OF ONTARIO.

By Tennyson D. Jarvis, B.S.A., Ontario Agricultural College, Guelph.

The following list of 48 species is certainly not a complete one for our province, but may serve as a basis for further work by other collectors. Twenty-eight of these are found on forest trees, 8 on fruit trees, 10 on shrubs, 9 on greenhouse plants, 2 on weeds, 2 on staple crops, and 1 in nest of ants.

I am deeply indebted to Prof. J. G. Sanders and Prof. C. L. Marlatt, Bureau of Entomology, Washington, for identification of many of the species. I owe thanks to Mr. L. Caesar for his assistance in describing many of the insects. To the following, also, my gracious acknowledgment is due for assistance in various ways: Dr. Bethune, O. A. College; Dr. Fletcher, Dominion Experimental Farm, Ottawa; Prof. C. C. James, Thomas Rivett and Percy Hodgetts, Department of Agriculture, Toronto. Many of the illustrations are after Lochhead (the San José Scale and other scale insects).

ORTHEZIINÆ.

(Arranged according to a Catalogue of Coccidæ of the World, by Mrs. Fernald.)

90 Orthezia Americana, (Walk)—Artemisia sp., Woodstock.
98 Orthezia insignis, (Dougl.)—Palm, Greenhouse, Toronto.

DACTYLOPIINÆ.

192 Asterolecanium variolosum, (Ratz.)—Oak, (Quercus sp.)—Niagara, Ottawa.
254 Kermes Pettiti, (Ehrh.)—White Oak (Quercus alba), Toronto.

255 Kermes pubescens, (Bogue)—Bur Oak (Quercus macrocarpa)—Guelph, Perth, Toronto.

279 Gossyparia spuria, (Modeer)—American Elm (Ulmus americana)—Toronto.

391 Phenacoccus aceris, (Sign.)—Soft Maple (Acer saccharinum), Amherstburg, Ont.

401 Phenacoccus Dearnessi, (King)—Hawthorn (Cratægus sp.), London.

454 Pseudococcus citri, (Risso)—Many species of plants, greenhouse, Ont.

490 Pseudococcus longispinus, (Targ.)—Many species of plants, greenhouse, Ont.

529 Pseudococcus trifolii, (Forbes)—Clover roots (Trifolium repens)—Collingwood.

572 Ripersia lasii, (Ckll.)—Nests of ants, Toronto.

699 Pulvinaria vitis (L.), (Rathvon)—Acer sp., Salix sp., Ilex verticillata, Cratægus sp., Tilia americana, Viburnum pubescens, Western Ontario.

661 Pulvinaria floccifera, (Westwood)—Brassia sp., greenhouse, Ottawa

848 Coccus hesperidum, (Linn.)—many species of greenhouse plants, greenhouse, Ont.

860 Coccus pseudohesperidum, (Ckll.)—Cattleya, greenhouse, Guelph, Ottawa.

959 Eulecanium quercifex, (Fitch.)—Red Oak (Quercus rubra), Jubilee Point, Lake Ontario.

918 Eulecanium caryæ, (Fitch)—Am. Elm (Ulmus americana); Hawthorn (Cratægus sp.)—Guelph, St. Catharines.

921 Eulecanium cerasifex, (Fitch)—trees, shrubs and vines of all kinds. All parts of settled Ontario.

935 Eulecanium Fletcheri, (Ckll.)—White Cedar (Thuja occidentalis), Guelph, Ottawa.

950 Eulecanium nigrofasciatum, (Perg.)—Soft Maple (Acer saccharinum), St. Catharines, Walkerville.

902 Toumeyella pini, (King)—Austrian Pine (Pinus Austriaca), London.

Toumeyella liriodendri, (Gmel.)—Tilia Americana, Ottawa.

DIASPINÆ.

1036 Chionaspis Americana, (Johnson).

1055 Chionaspis furfura, (Fitch)—Pyrus, Cratægus, Ontario.

1062 Chionaspis Lintneri, (Comst.)—Alder (Alnus incana), Dogwood (Cornus stolonifera), London, Guelph, Rondeau, Ottawa.

1073 Chionaspis pinifoliæ, (Fitch)—Pinus and Picea, Ontario.

1081 Chionaspis salicis, (Linn.)—Leatherwood (Dirca palustris), White Ash, (Fraxinus americana), Guelph.

1096 Aulacaspis Boisduvalii, (Sign.)—Palm, greenhouse, Guelph.

1127 Aulacaspis rosæ, (Bouche)—Rose, Raspberry, etc., Ontario.

1143 Hemichionaspis aspidistræ, (Sign.)—Pteris serrulata, Ottawa.

1199 Aspidiotus æsculi, (Johnson)—Tilia americana, Toronto, Brantford, Guelph.

1200 Aspidiotus ancylus, (Putn.)—Weeping Willow, Am. Elm, Belleville, Ottawa, Toronto, St. Catharines.

1220 Aspidiotus diffinis, (Newst.)—Basswood (Tilia americana), Guilds.

1229 Aspidiotus Forbesi, (Johnson)—Beech, Fragrant Currant, Apple, Plum and Hawthorn—London, Ottawa, Niagara District.

1233 Aspidiotus hederæ, (Vall.)—Oleander, etc., greenhouse, Ontario.

1239 Aspidiotus juglans-regiæ, (Comst.)—Apple, Willow, Cottonwood, Niagara, Collingwood.

1250 Aspidiotus Osborni, (Newell and Ckll.)—Quercus alba, Betula lutea—Guelph, Toronto.
1252 Aspidiotus ostreæformis, (Curt.)—Apple, Pyrus, Maple, (Acer saccharinum, Hawthorn, Ontario.
1256 Aspidiotus perniciosus, (Comst.)—Apple, Pear and many shade trees—Niagara district, London, Aylmer, Essex district.
1270 Aspidiotus ulmi, (Johnson)—Ulmus americana—Guelph, Toronto.
1300 Chrysomphalus dictyospermi, (Morg.)—Cinnamon, greenhouse, Ottawa.
1305 Chrysomphalus obscurus, (Comst.)
1330 Targionia Dearnessi, (Ckll.)—Arcostaphylos uva-ursi, Bruce Peninsula, Shores of Lake Huron.
1377 Lepidosaphes Beckii, (Newm.)—imported oranges and lemons.
1431 Lepidosaphes ulmi, (Linn.)—many species of trees, Ontario.
1442 Parlatoria Pergandei, var. theæ, (Comst.)—lemon, O.A.C. greenhouse.

The San José Scale, *Aspidiotus perniciosus*, (Comst.), figs. 10-14.

Wherever it occurs the San José Scale is considered, and rightly so, the most destructive insect that fruit growers have to combat. Fortunately for us, however, in Ontario it is confined to the south-western portion of the province.

The mature female scale is small, circular, 1-2 mm. in diameter, only slightly convex, grayish brown in color except the central part, which is often of a lighter shade, being usually a light yellowish-brown color. The exuviæ or larval skin is centrally situated, or nearly so. The surface is fairly smooth. Sometimes a sooty fungus (*Fumago salicina*) darkens the color of the scale.

The male scale is much smaller and different in shape. It is oblong instead of circular, and about twice as long as broad, but the total length is only about half the diameter of the female. The exuvial part is not central, but situated near one end. The color as a rule is considerably darker than that of the adult female.

The usual appearance of the wintering stage of the female scale is different from the summer form, being very small, almost black and circular, with exuvial part central. There is a distinct nipple with a ring or depression around it.

There are four other Aspidiotus scales found in Ontario which are very difficult to distinguish from the San José scale. The particular points of difference between each of these and the San José scale will be discussed as these scales are respectively taken up. It should be noted, however, that if one takes his knife and cuts off a slice from a twig or branch affected with San José scale the cambium and some of the sap-wood just beneath the bark will be seen to be colored purple. This purplish color is very often seen also on the surface of the bark, and on the fruit around where the scale is situated.

Though the scale insects are in all stages when winter comes on, yet by far the majority of the females are of the type described above under the heading of the wintering stage. In the spring, about the end of May, though this year not until the middle of June, the winged males come forth and fertilize these half-grown females. About a month after this, the latter begin to give birth to living young. About eight or ten young are born in a day as a rule, and a single female continues to reproduce at this rate for about six weeks, when she dies. A young female takes about forty days to mature and then in turn begins to produce living young. In this way we find that all stages of the insects are to be found all through the summer until the frost stops the reproduction. So very prolific is the insect that it has been calculated that if every scale were to live and mature, 3,000,000,000 individuals ould be traced back to a single fertilized female in one summer. Hence it is easy to understand why the scale so quickly destroys infested trees. It is usually found that if no steps are taken to check the pest, it will kill young thrifty trees in three years.

Almost any kind of fruit trees and bush fruits are liable to be attacked by the scale. Many shade and forest trees are also attacked.

Remedies.

(1) There is one great standard remedy that has given good satisfaction whenever carefully made and thoroughly applied, namely, the lime-sulphur wash. This should be put on in the spring, or in badly infested orchards it will pay to give the trees a double dose, one in autumn as soon as the leaves fall and the other in the spring before the buds have burst.

(2) Kerosene emulsion, whale oil soap, and a number of other ready-made oil washes, like Scalescide, give fairly good results. They have not, however, been found to be so reliable as the lime-sulphur wash, and in addition are much more expensive.

Before any tree is sprayed it should be carefully pruned and the branches thus removed should be burned.

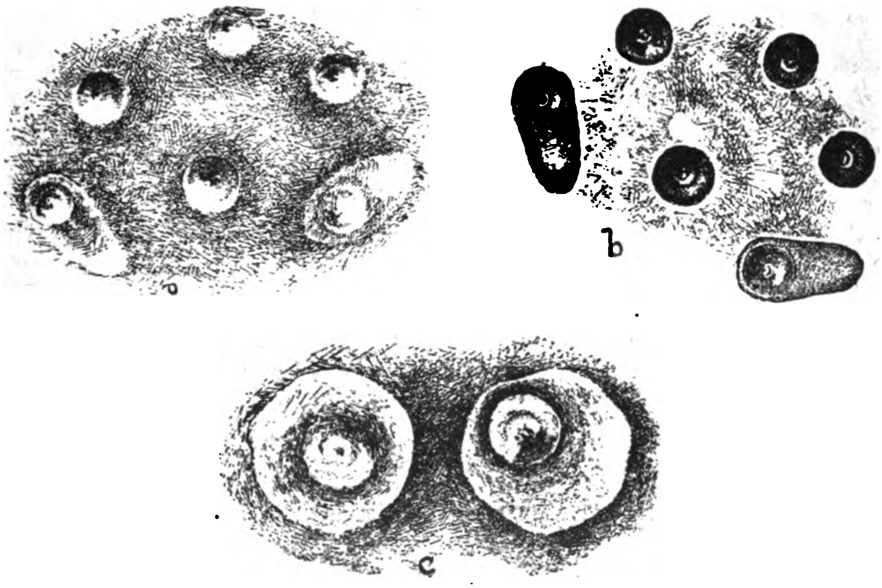


FIG. 10. San José Scale (*Aspidiotus perniciosus*). (*a*) Four young scales and two male scales, showing the nipple and ring even in the very young forms; (*b*) four immature female scales, and two nearly grown male scales, showing the prominent nipple and circular groove about the nipple, of the black scales; (*c*) two small female gray scales, showing the central nipple and circular groove. One scale has a nipple not central. The body of insect is beneath the scale.

Parasites.

(1) Two small Chalcid flies, *Aphelinus mytilaspidis* (Le Baron), and *Aphelinus fuscipennis*, (How.)

(2) Two ladybird beetles, *Pentilia misella*, (Lec.), fig. 15, and *Chilocorus bivulnerus*, (Muls.)

(3) In some districts a fungus ,*Sphærostilba coccophila*. It is difficult to say whether the latter is at work in Ontario.

Note.—At the 1906 meeting of the Entomological Society of Ontario, I gave observations on a scale insect, which I thought to be the San José scale, in gardens at Toronto. Since that time I have made a more careful microscopic examination, and find it to be *Aspidiotus ostreæformis* or Curtis scale. The bark around the scale was pink, much like the appearance of the San José scale infested bark.

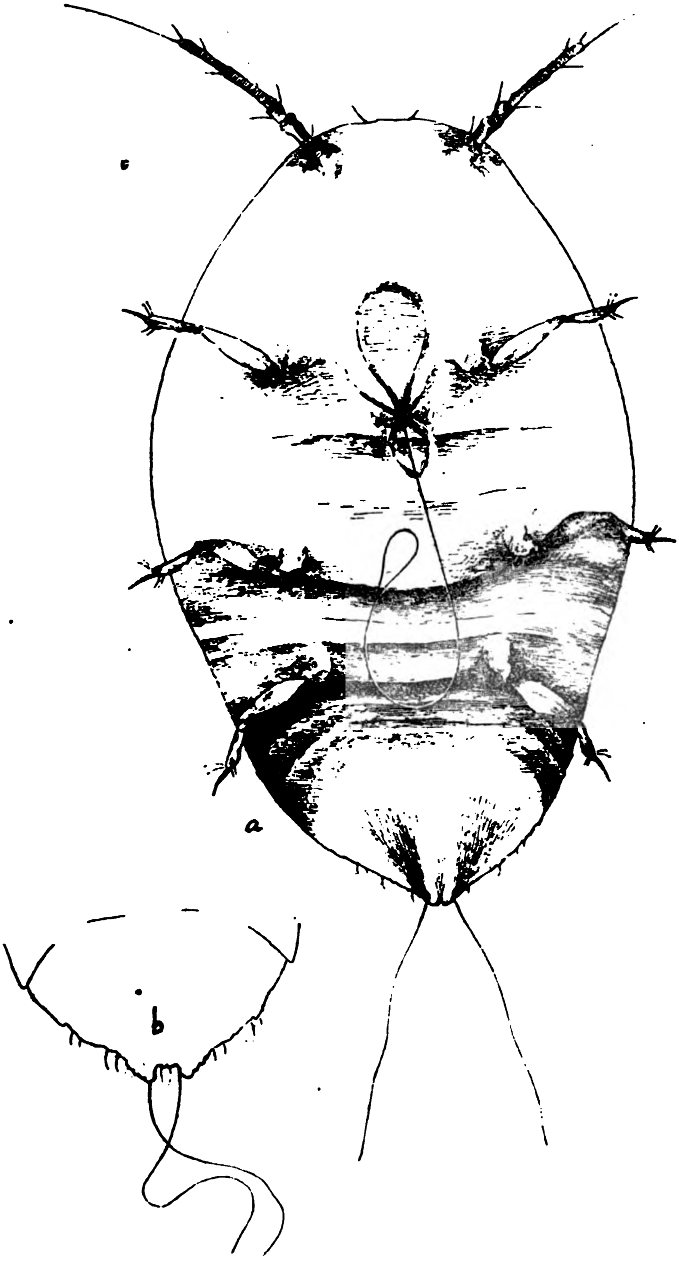


Fig. 11. San José Scale larva, the active crawling form, showing the two feelers, six legs, and long sucking tube; (*b*) enlarged drawing of anal plate.

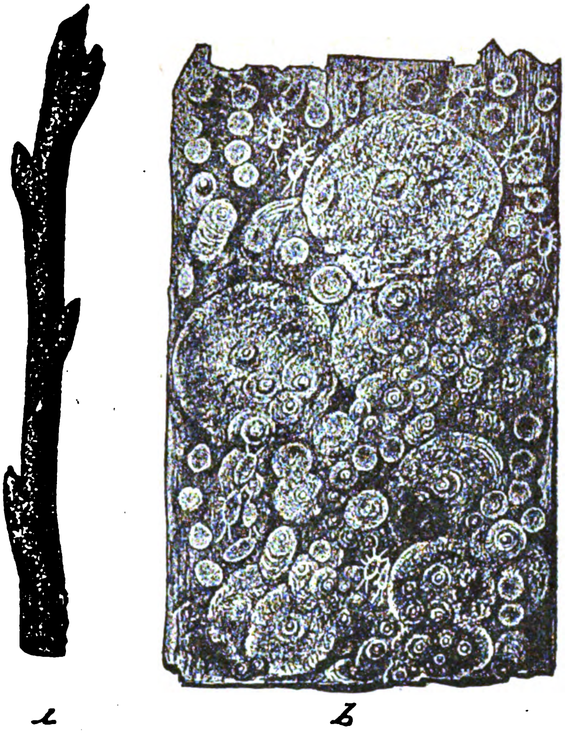


Fig. 12. A portion of branch covered with San José Scale. Appearance of scale on bark; (*a*) infested twig, natural size; (*b*) bark as it appears under hand lens, showing scales in various stages of development and young larvæ.

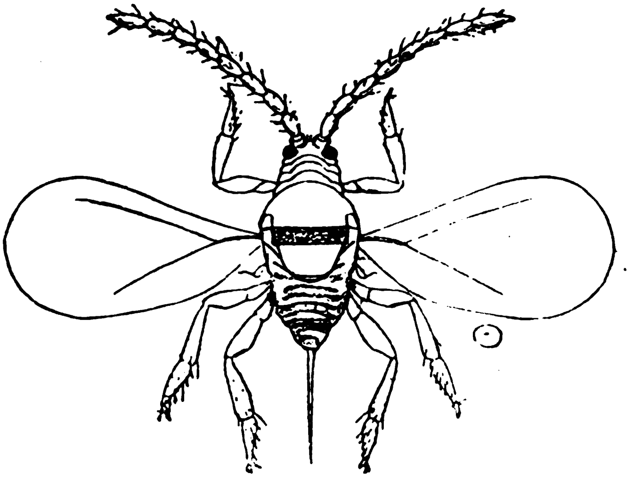


Fig. 13. Adult male insect of San José Scale, escaped from covering scale, showing the two wings, two feelers, two eyes, six legs, and long anal style. (Div. Ent. U.S. Dept. Ag.)

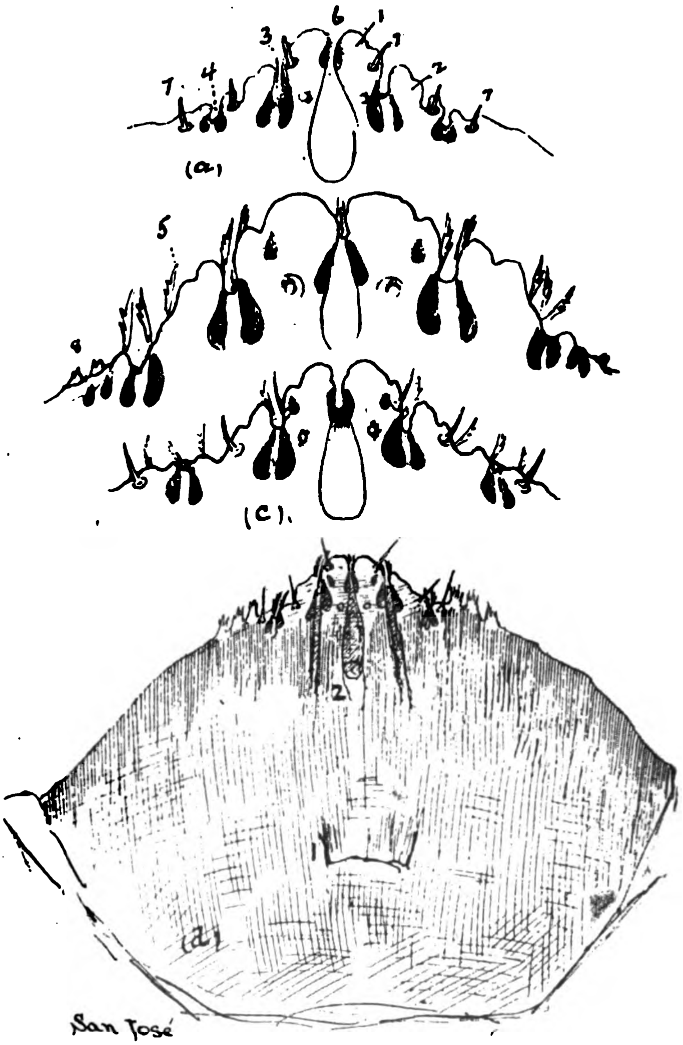


FIG. 14. Anal plates of female San José Scale. (*a*) Anal plate, showing median lobe (1), second lobes (2); incisions (6), (3), (4); chitinous thickenings on each margin of these incisions, and the spines (7) on each of the lobes. (The plates have not been drawn in this case). (*b*) Anal plate, showing the lobes, incisions, thickenings, and plates (5) a pair of plates between median lobes, a pair at first incision, and three at second incision. Notice the large size of second lobe, which is notched once on the margin. (Spines have not been drawn). (*c*) Anal plate, showing both spines and plates. Notice the chitinous thickenings between the median and second lobes are nearly equal in size and close together. (*d*) Anal plate and last segment of adult female. There are no ventral glands. (1) Vaginal opening; (2) anal opening.

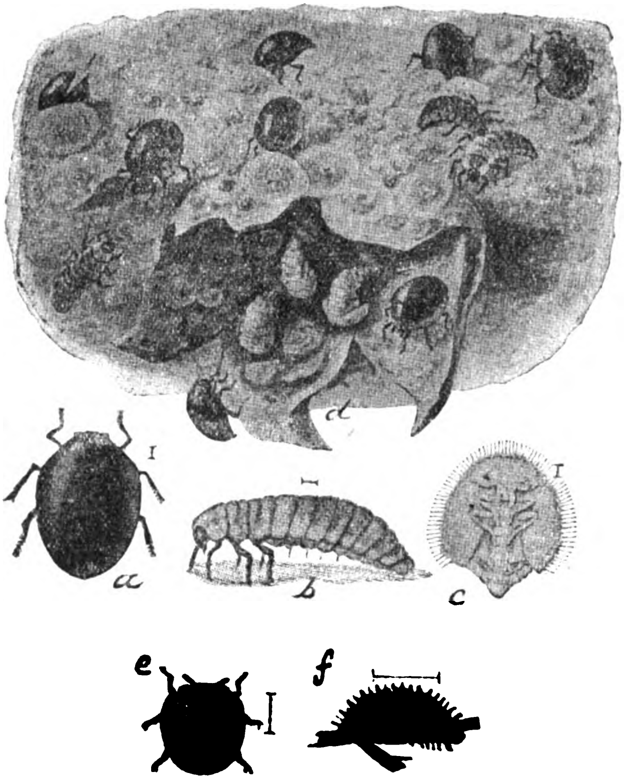


Fig. 15. Two enemies of the San José Scale. (*a*) Beetle; (*b*) larva; (*c*) pupa of Pitiful Lady-beetle (*Pentilia misella*); (*d*) blossom end of pear, showing scales with larva and beetles feeding on them; (*e*) Twice-stabbed Lady-beetle (*Chilocorus bivulnerus*); (*f*) its larva. (*a, b, c* and *d* after Howard, & Marlatt, *e* and *f* after Riley).

Curtis scale (*Aspidiotus ostreæformis* Figs. 16-18.

This scale is much more widely distributed throughout Ontario than has been hitherto supposed, but in spite of its prevalence, it does not seem to be very destructive.

The adult female resembles the San José in being circular and having the exuviæ centrally situated as a rule, though with many exceptions. It differs, however, in several important particulars: (1) It is considerably larger, averaging about 2 mm. in diameter, whereas the San José averages about 1.4 mm. (2) It is much more convex. (3) A smaller proportion of the exuvial part is light colored, in fact only the nipple, whereas a considerable part of the central portion of the San José was lighter than the general color of the scale. (4) There is a light or whitish colored margin to be seen around the outside of most of the scales. (5) The surface is rougher. (6) The usual winter form is not nearly black like the San José but is a whitish brown, and has no ring or depression around a distinct nipple.

This scale passes the winter in mature condition for the most part. It matures about the end of June. Like the San José it brings forth living young which continue to be produced throughout nearly all of July. There is, however, only one generation in a year.

The scale has been reported to us or found by us in very many places in Collingwood on the west to Trenton in the east.

Its chief food plants in Ontario seem to be the apple and pear. It is said, however, to attack also the plum, cherry, currant, mountain ash, elm, basswood, Carolina poplar, and willow.

Natural enemies:

(1) A white fungus, commonly attacks it at Guelph. See Plate D.

(2) A few of the scales were perforated in a manner characteristic of Chalcid flies, so that it is probably attacked by one of these tiny parasites.

Remedies:

Scrape the rough bark off the trunks of trees and use the same remedies as for San José scale.

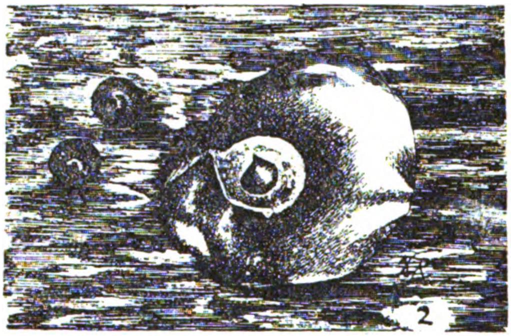


FIG. 16. Curtis Scale (*Aspidiotus ostreæformis*), **greatly magnified.**

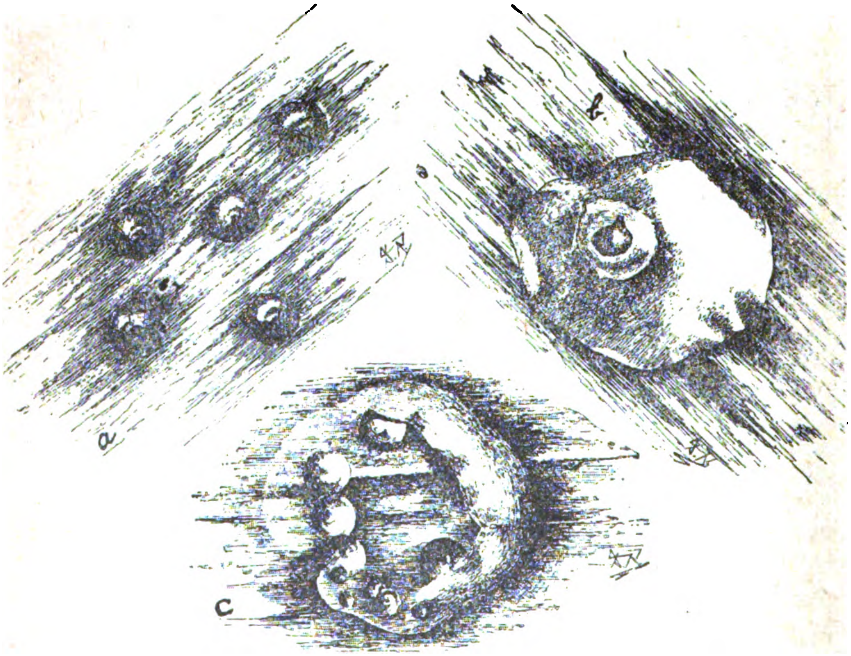


FIG. 17. Curtis Scale (*Aspidiotus ostreæformis*). (*a*) Young scales which are not nearly full-grown; the nipple is plain, but the circular grove about it is wanting; (*b*) Full-grown pregnant female; the nipple is large; (*c*) old scale with several young scales hidden beneath it—a characteristic feature.

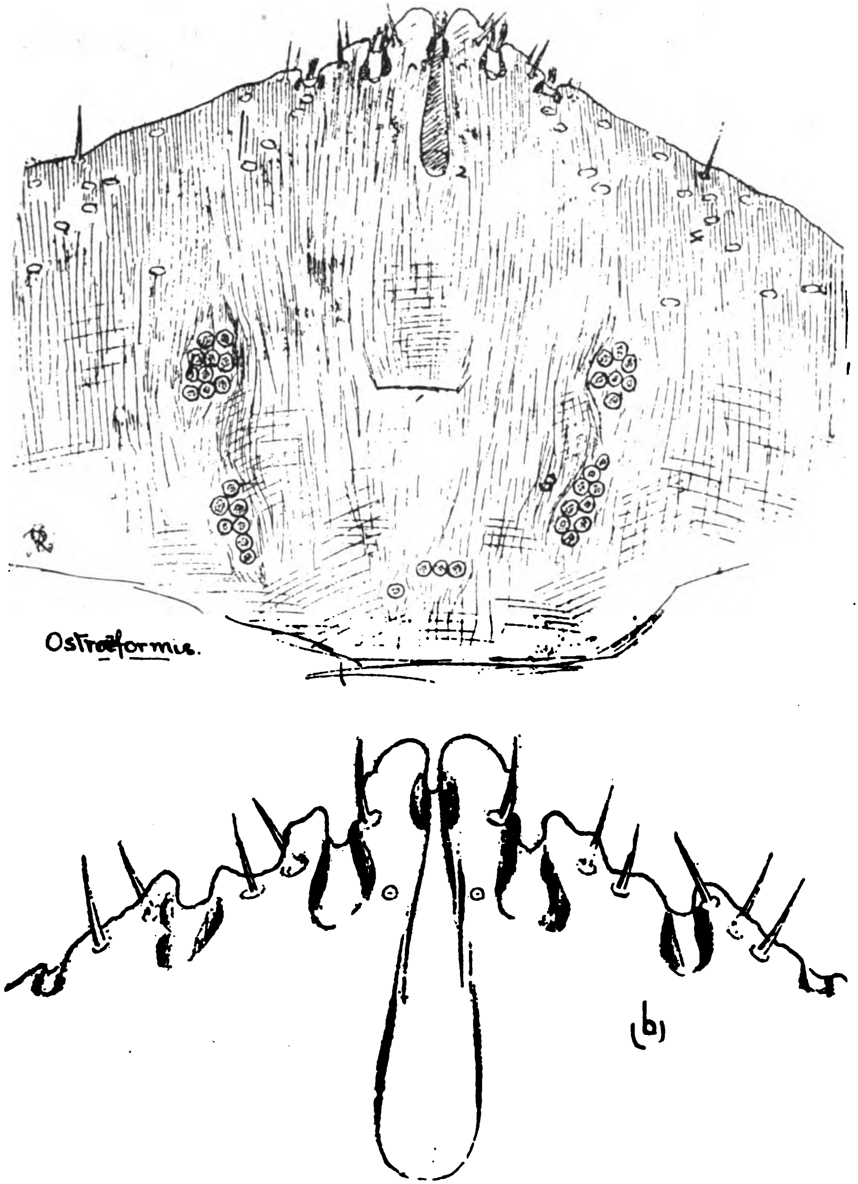


FIG. 18. Anal plate of Ostreæform or Curtis Scale, showing lobes, incisions, thickenings, and spines. The inner angles of second lobe are decidedly developed; outer lateral margin of second lobe undulating; chitinous processes of first incision long and nearly equal in size; (*b*) anal plate much enlarged.

The Cherry Scale, *Aspidiotus Forbesi* (Johnson). Figs. 19 and 20.

The Cherry Scale, although found in several localities in Ontario, has not yet, with one or two exceptions, been reported as doing much damage.

The adult female scale is circular, nearly smooth, slightly convex, about 1.3-1.5 mm. in diameter, and has the exuviæ usually centrally situated. The general color varies from a yellowish brown to a greyish yellow. The exuvial part is usually orange.

The adult female scale is very difficult to distinguish from the San José. The San José, however, has the exuviæ light brown, the Cherry has orange exuviæ. The immature San José scales are often dark and have a distinct nipple, with a ring or depression around it; the immature Cherry scales are much the same color as the mature scales and there is not the same prominent nipple and encircling ring. Furthermore the San José scale discolors the fruit, bark and cambium layer, the Cherry scale does not.

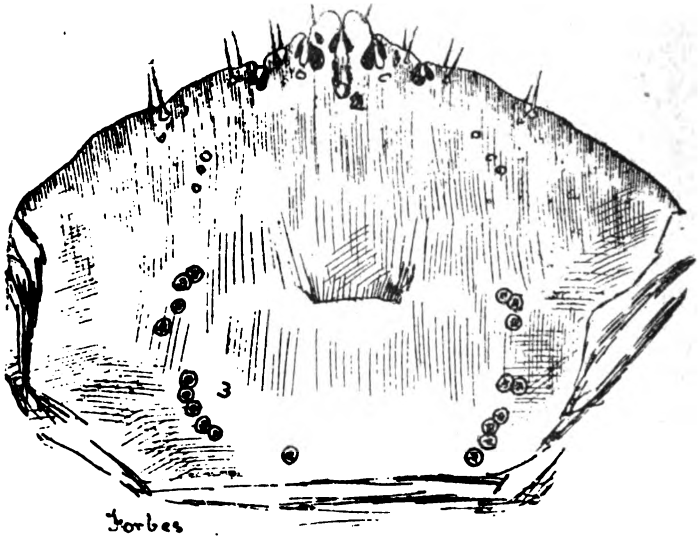


Fig. 10. Anal plate of Forbes Scale, showing lobes, incisions, thickenings, and spines; also anal opening (2), vaginal opening (1), and ventral glands (3). Notice that the median lobes approximate at apex, and that the inner thickening at first incision is very large and club-shaped.

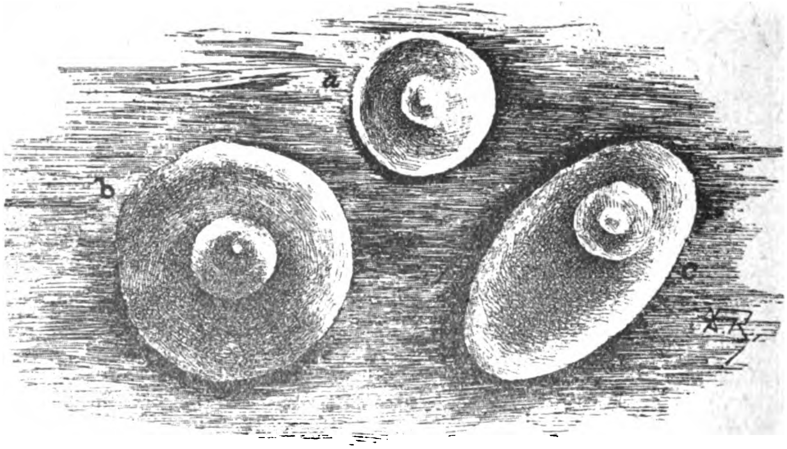


Fig. 20. Forbes or Cherry Scale. (*a*) Young scale, light colored, with central nipple but no circular groove; (*b*) adult female scale with central or nearly central, orange-colored nipple, and gray outer margin of scale; (*c*) male scale, showing the oval shape, and nipple near one end. The body of the insect is under the scale.

The life history of this scale is said to be as follows: It passes the winter in a partly grown stage. The males emerge about the end of April. In May the young begin to come forth and eggs and young may both be found up to about July. There are two broods in some of the American States, but whether there is more than one in Ontario has not yet been discovered.

The Cherry scale has been found in Ontario at Ottawa, London, St. Catharines, Grimsby, and in Prince Edward county.

The host plants so far discovered are cherry, apple, hawthorn, fragrant currant, and beech.

Remedies:

The same remedies should be used as for the San José scale.

Natural Enemies:

Several species of Chalcid flies are said to attack it, also a tiny white mite, and the twice-stabbed ladybird beetle (*Chilocorus bivulnerus*, Muls.)

The English Walnut Scale (*Aspidiotus juglans-regiæ*, Comst.) Figs. 21 and 22.

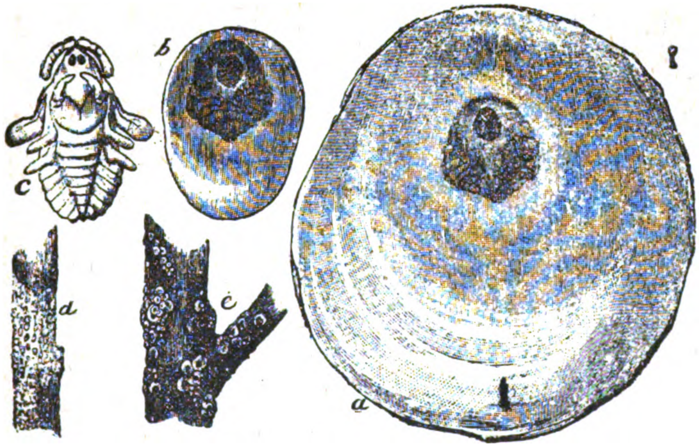


FIG. 21. The English Walnut Scale (*Aspiodiotus juglans-regiæ*). (*a*) Female scale; (*b*) male scale; (*c*) male chrysalis; (*d*) male scales on twig; (*e*) female scales on twig. *a*, *b*, *c*, enlarged; *d*, *e*, natural size. After Howard. From U.S. Dep. Agr., Year Book for 1894.

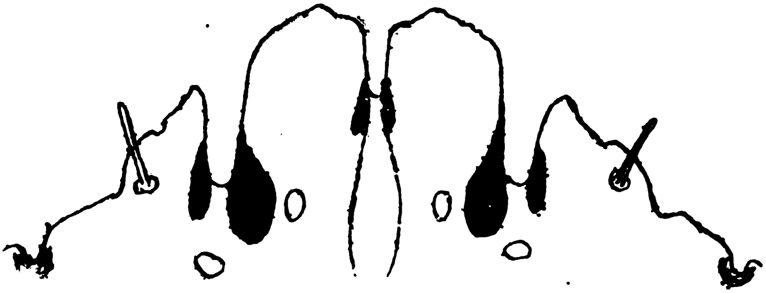


FIG. 22. Anal plate of English Walnut Scale, showing the large median lobes, and notched outer margin of second lobe.

The English Walnut scale has been found in Ontario in only two or three localities, although it probably exists in several others. If some samples from Collingwood, sent by this department to Washington, and thought by the authorities there to belong to this species, should prove to be really such, the scale is capable of doing great injury to the trees it attacks. The poplars and willows at Collingwood on which it was found were very thickly covered, and were dying, apparently from the effects of the scale.

The adult female scale is larger than any other species of Aspidiotus described in this paper, averaging almost 3 mm. in diameter. It is circular or nearly circular in outline, very flat for its size, resembles closely the color of the bark it is on, being usually a pale grayish brown. The exuviæ are usually eccentric and are orange or reddish in color, though often this color is partly concealed by a waxy secretion.

Though the adult female of this scale is easily distinguished from the San José by its large size and reddish eccentric exuviæ, yet the winter stage of some specimens we have received is with great difficulty distinguished from the winter stage of the San José. The chief points of distinction seem to be: (1) The winter stage of the Walnut scale is a little larger than that of the San José; (2) Even in these winter scales, the reddish exuviæ can often be seen with the aid of a lens although a waxy secretion almost conceals it. In the San José scale this reddish color does not appear.

We have very little knowledge of the life-history of this scale. From specimens we have seen this autumn it seems to pass the winter for the most part in an immature stage. It does not bring forth its young alive but lays eggs. There is probably more than one brood in a season.

The scale has been found only at Grimsby and Collingwood (?)

The host plants so far discovered in Ontario are apple, willow and poplar.

Remedies:

The same remedies should be used as for the San José scale.

We have not been able to observe what natural enemies this scale has.

The Putnam Scale, *Aspidiotus ancylus*, (Put.) **Fig. 23.**

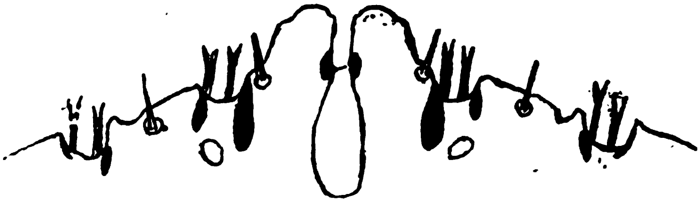


FIG. 23. Anal plate of the Putnam Scale, showing the unequal thickenings in first incision, the rudimentary second lobe, and the wide interval between median and second lobes.

The Putnam scale is distributed fairly widely throughout Ontario. It has not, however, been known to do much damage in the province although in some of the states across the boundary it is said to have been quite destructive.

The adult female scale is usually more nearly oblong than circular, about 1.5 mm. long, 1-1.3 mm. wide, and slightly convex. The general color is greyish black, varying somewhat with the color of the bark it is on. The exuvial part is eccentric and practically always red or reddish. Sometimes this red color is obscured by a whitish film which can easily be rubbed off.

This scale can be easily distinguished from the San José by its oblong shape and the red eccentric exuviæ. It has the peculiarity of producing in a small degree the purplish color so characteristic of the San José scale.

It passes the winter in a nearly full grown stage. The males begin to appear, it is said, in May. In late spring or early in summer the female lays from 30 to 40 eggs. These hatch in July. There is only one brood in a season.

The scale has been reported from Ottawa, Toronto, Belleville, St. Catharines, and Kingsville.

It has been found on plum, elm, and willow in Ontario, but is said to attack also cherry, apple, red currant, maple, oak, ash, and beech.

Remedies:

The same remedies should be used for this scale as for San José.

Parasites:

The only parasite we have heard of as attacking it is a minute Chalcid fly, *Coccophagus varicornis*, (How.)

Osborn's Scale (*Aspidiotus Osborni*).

Osborn's scale is found on forest trees in northern and western Ontario.

The mature female is about the same size as the Curtis scale, averaging about 2 mm. in diameter. It is very smooth and circular, and the exuviæ is eccentric. The general color is brown, varying somewhat with the color of the bark of the host; under the loose bark of the paper birch the color is gray.

It has been found on paper birch, yellow birch, cottonwood, and white oak.

It passes the winter in a nearly full grown stage.

Parasites:

The work of Chalcis flies have been found on several occasions.

The New York Plum Scale, *Eulecanium cerasifex* (Fitch.) Fig. 24.

The New York Plum Scale has become one of our most common scales and like the Oyster-shell scale has spread over practically the whole province. Though not so destructive as the Oyster-shell, it is often quite injurious where abundant and sometimes kills the infested tree.

The scale is one of our largest species. The mature female is nearly hemispherical, but usually a little longer than broad, being 3-5 mm. and 2.5-4 mm. wide. It varies in color from light brown to almost black. The surface is usually glossy with, however, numerous little depressions and elevations which sometimes take the form of grooves and ridges radiating from the apex to the base.

The male scale is very unlike the female in shape, size and color. It is elongated in form, 2-2.5 mm. long, and 1 mm. wide, only slightly convex, and is grayish white in color. Both male and female scales are found near each other on the same branch.

The winter is passed by both sexes in the half-grown stage. The winged males appear June 1st (this year, 1907, it was June 12th), and soon after this the females lay their eggs and die, but their dead body still remains as a cover for the egg mass. About the end of June (this year on July 19th), the eggs begin to hatch out. There are sometimes about 1,000 eggs laid by a single scale. The young scales move from the branches to the leaves where they remain until autumn and then migrate back to the branches for the winter. There is only one generation in a year.

We have found this scale on a great range of trees and other plants at Guelph, the following being the list as observed up to date of writing:—apple, plum, pear, mountain ash, hawthorn, currants, gooseberry, wild red

raspberry, wild black currant, wild grape, Virginia creeper, elder, red-osier dogwood, mountain maple, black maple, silver maple, white ash, black ash, beech, blue beech, ironwood, basswood, alder (Alnus incana), poplar (Populus alba), rock elm, American elm, prickly ash, butternut, black walnut, catalpa, hazel-nut, pin-cherry, bur oak, English oak (*Quercus robur*), sweet hickory, and many species of herbs near infested trees.

Remedies:

(1) The lime sulphur spray. This must be very carefully put on as the scales for the most part in fall, winter, and spring, are to be found on the lower side of the branches.

(2) Kerosene emulsion, applied when the tree is dormant, preferably as soon as the leaves fall in autumn. Dilute the stock emulsion with four parts of water.

(3) Kerosene emulsion, flour kerosene, or whale-oil soap at ordinary strength applied as soon as eggs have hatched, which must be determined by actual observation each year.

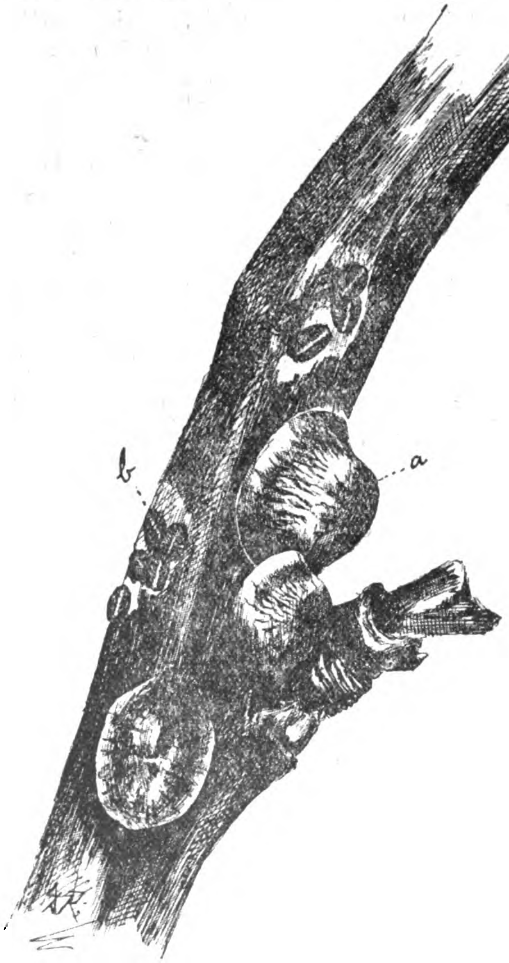


FIG. 24. Twig of plum infested with Lecanium or New York Plum Scale. (*a*) The old scale of the previous summer empty and lifeless; (*b*) the immature wintering scales, which will become full grown like (*a*) next June.

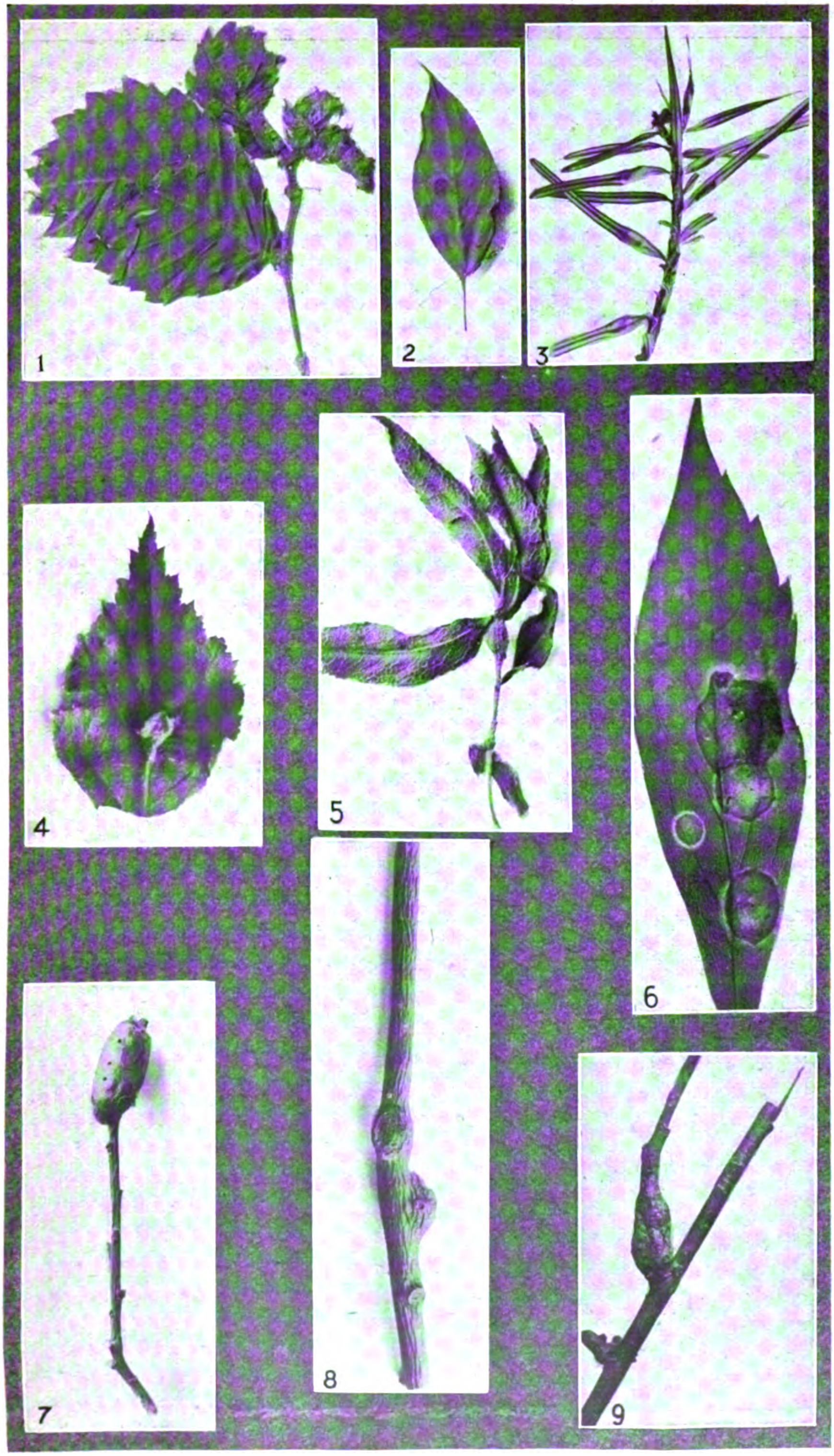


PLATE A.

1. Cecidomyia ulmi, Beuten.
2. Lasioptera corni, Felt.
3. Cecidomyia balsamifera, Lintner.
4. Hormomyia cratægifolia, Felt.
6. Choristoneura flavolunata, Felt.
7. Rhabdophaga batatas, O.S.
8. Agromyza æneiventris, Fallen.
9. Rhabdophaga nodulus, Walsh.

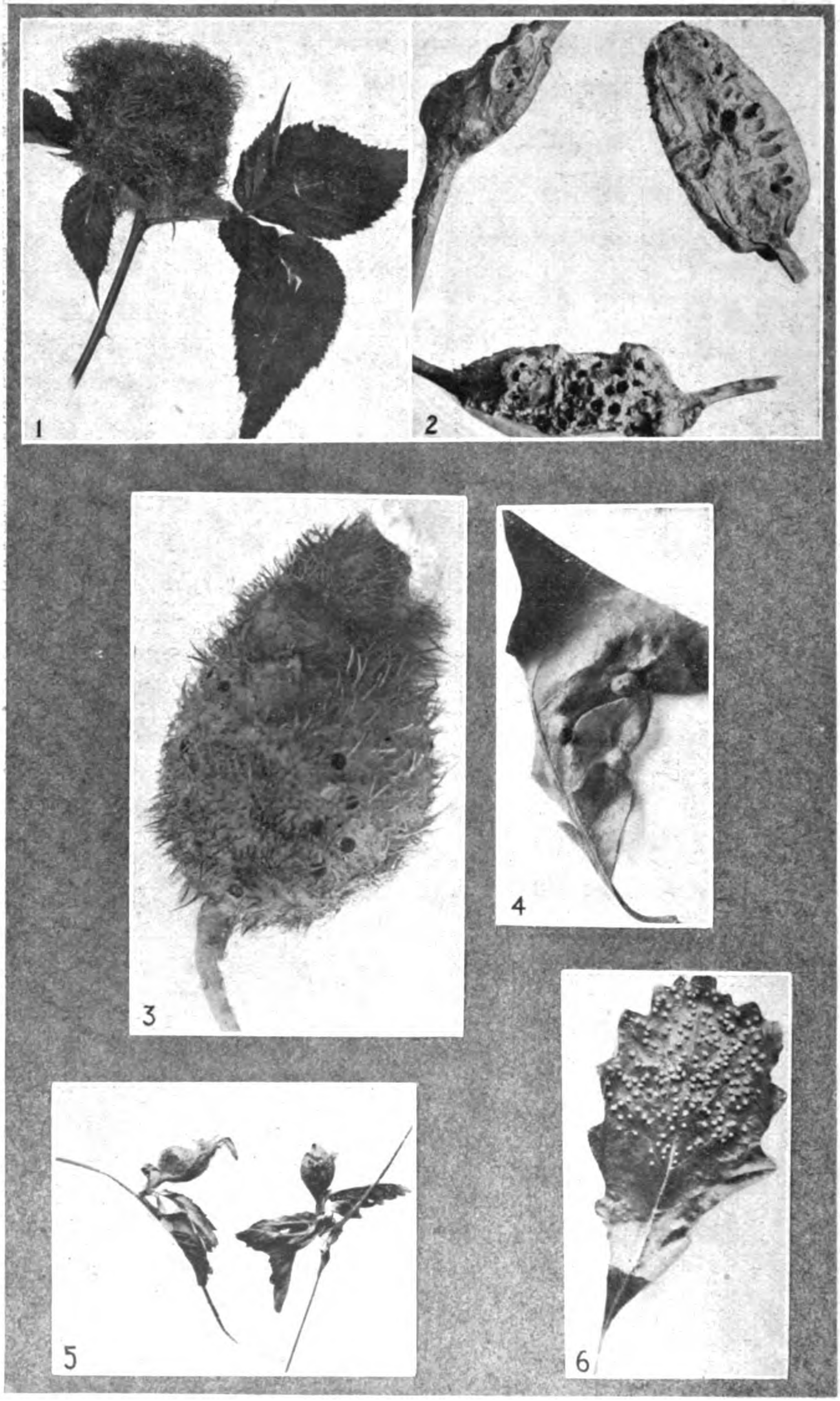


PLATE B.

1. Rhodites sp. on Blackberry.
2. Diastrophus turgidus, Bass.
3. Rhodites multispinosus, Gill.
4. Andricus futilis, O.S.
5. Diastrophus potentillæ, Bass.
6. Neuroterus umbilicatus, Bass.

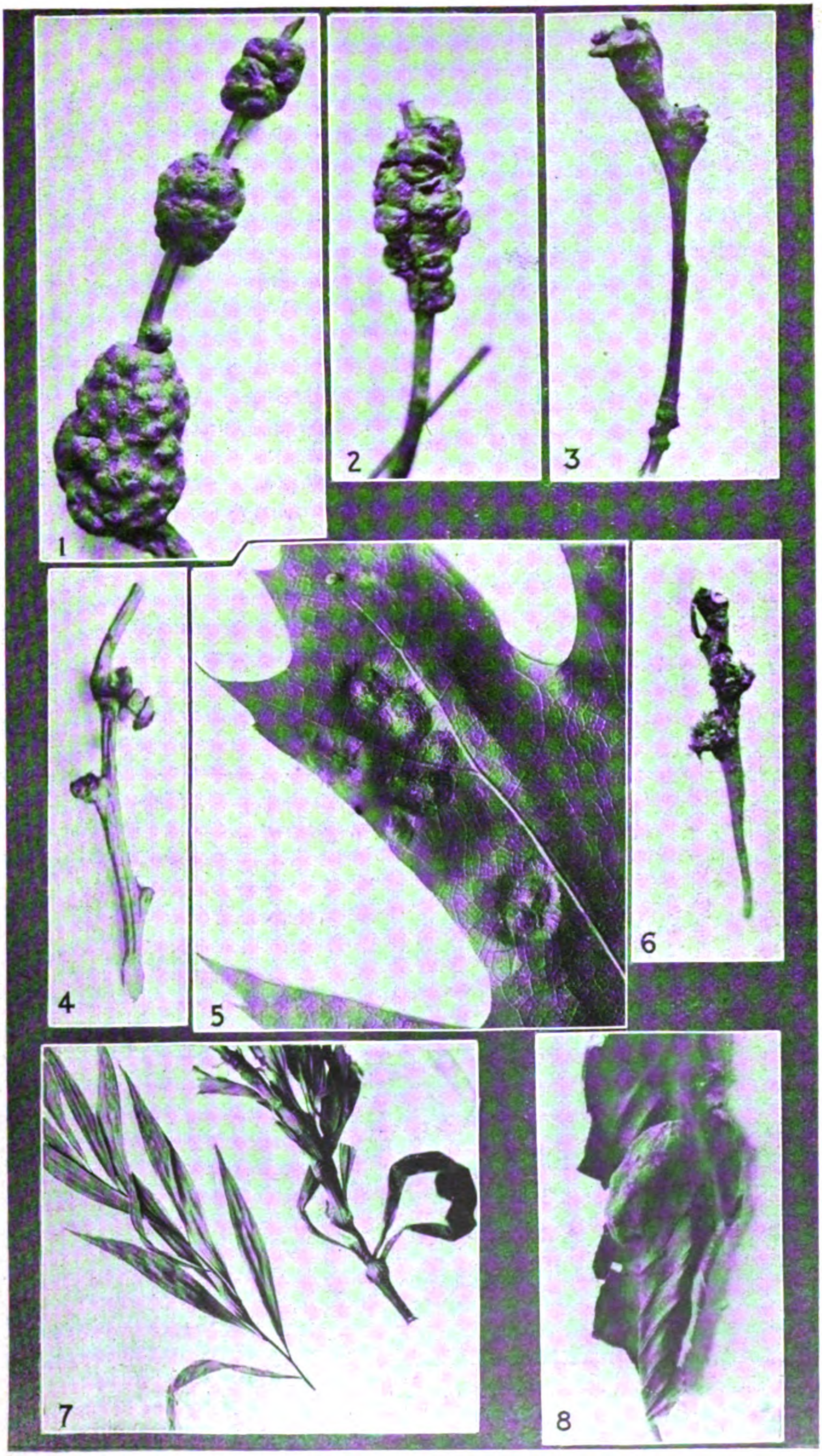
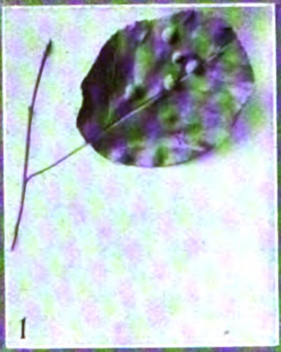


Plate C.

1. Andricus punctatus, Bass.
2. Biorhiza forticornis, Walsh.
3. Andricus clavula, Bass.
4. Cynips strobilana, O S.
5. Andricus papillatus, O.S.
6. Andricus topiarius, Ashm.
7. Eucosma scudderiana, Clem.
8. Pemphigus ulmi-fuscus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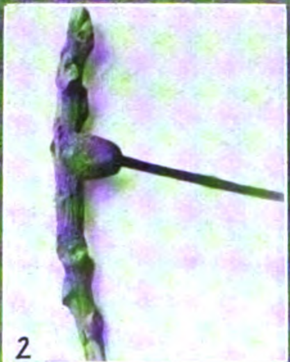
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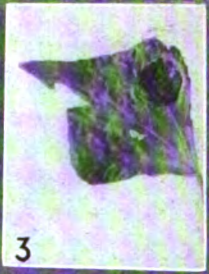
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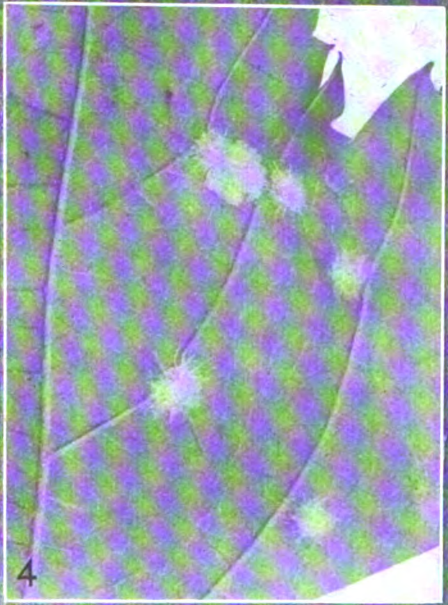
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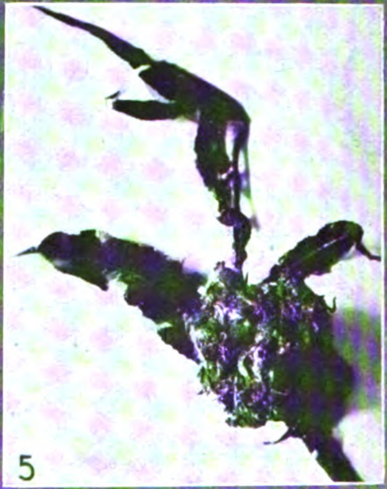
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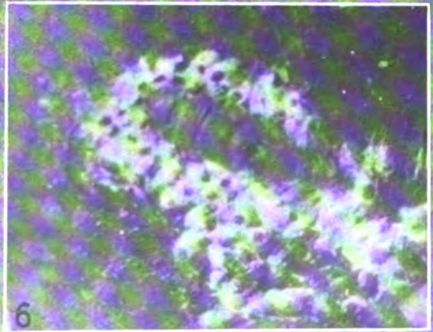
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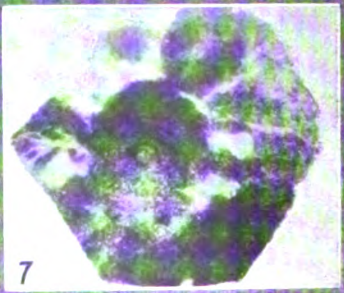
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PLATE D.

1. **Eriophyes sp., Amelanchier Canadensis.**
2. **Eriophyes sp., Juglans nigra.**
3. **Eriophyes sp., Populus italica.**
4. **Eriophyes sp., Vitis cordifolia.**
5. **Eriophyes sp., Salix fragilis.**
6. **Young Oyster-shell scales parasitized by a fungus.**
7. **Curtis scale parasitized by a fungus.**

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Parasites:

(1) A fungus disease (Cordyceps clavulata), attacks and destroys many of the scales.

(2) At least 3 chalcid flies, *Pachyneuron altiscuta* (How.) *Eunotus lividus* (*Ashm.*), and *Coccophagus cognatus* (How.)

(3) Several species of lady-bird beetles.

(4) A large flesh-colored species of larva was found feeding on the eggs but we were not able to rear the adults.

The Terrapin Scale, *Eulecanium nigrofasciatum* (Perg.)

This scale was first discovered in Ontario in 1901 at St. Catharines. Up to the present time it has been reported to us only from St. Catharines, Walkerville, and Windsor. In each case the infested twigs forwarded were taken from maple trees and these were literally covered with the scale. It is clear from such specimens that a badly infested tree would soon die, and so the scale is one to be guarded against. Mr. Sanders of the Bureau of Entomology, Washington, in his circular No. 88, says that the scale must be considered a "dangerous pest."

The easiest time to recognize this scale is in the winter stage. At this season it is considerably smaller than the New York Plum scale, *Eulecanium cerasifex*, which, even when mature, it never equals in size. It has the same general shape as this well known scale, being nearly hemispherical. It is about 2 mm. in length and slightly less in width. Along the top running longitudinally is a reddish streak or stripe about 1 mm. long and .3 mm. wide. The rest of the surface is usually mottled red and black, the red forming the ground, so to speak, and black stripes radiating from the reddish top to the base. Sometimes the black forms a belt around the scale extending from the red boss or crown nearly to the base, which has also often a red margin in such cases. Not uncommonly a scale looks almost entirely red or on the contrary almost entirely black. When mature there is still the same general color and shape but there is an increase in size, the scale now being 3-3.5 mm. long and somewhat less than this broad. Later in the season the color fades.

A peculiarity, at least, of the winter stage of the scale is that when punctured or crushed, a reddish liquid exudes from the wounds.

The eggs are laid in the spring and hatch about the end of June. In August the tiny winged males emerge and consequently the half-grown females are fertilized the same season.

Although only maple trees have been reported to us as being attacked up to the present time in Ontario, yet we find that in the United States the scale infests not only these but also the peach, plum, apple, pear, quince, hawthorn, and several other trees. Hence it is clear that fruit-growers should be on their guard against it.

Remedies:

The lime-sulphur wash has proved a failure in the case of this scale and the most satisfactory remedy so far discovered is to spray the trees carefully when the leaves are off with kerosene emulsion of about 25 per cent. strength. Care should be taken to prevent the emulsion running down the trunk and getting to the roots which it would probably injure. Late autumn or early spring before the buds begin to burst would be the proper time to spray. While this is practically the only spray recommended against this scale insect, some very able entomologists doubt whether even it is anything like so successful as its advocates claim. Seeing that there is so much doubt about the effectiveness of washes and that the scale is capable of doing grea damage, the proper course to take is to be on one's guard against allowing it to get a footing and, if a tree should be found to be infested, cut it down and burn it at once, thus taking no risks.

Parasites:

This scale like almost all the rest has its insect foes, a tiny chalcid fly of the genus Coccophagus has been found to attack it. A fungus parasite known as Cordyceps clavulata is not uncommon on this scale.

Eulecanium caryæ, (Fitch).

Eulecanium caryæ is said to be the largest known species of Eulecanium. It has been in Ontario for at least ten years, having been discovered by Dr. Fletcher in the Niagara district in 1898. Judging from the fact that it has been found in that district and that we have discovered it at Guelph on several trees in the forest, it probably occurs at least all over the south-western part of Ontario. From our own experience and that of others we believe that the scale is very seldom abundant on any tree; in every case where we discovered mature scales there were only two or three at most, and often only one specimen to be found on a branch (always on the under side). Consequently the scale is seldom sufficiently injurious to cause any alarm.

It is easily identified by its large size, being more than twice as large as the New York Plum scale (Eulecanium cerasifex). Like this scale Eulecanium caryæ is more or less hemispherical in shape. It is 7-10 mm. long, 6-9 mm. broad, and 3-4 mm. high. The surface is glossy, light brown to black in color, and covered with a fine powder. On all the specimens a keel-like structure ran longitudinally from end to end through the centre. The rest of the surface was more or less rugose. In some cases we could see fine (including the keel-like structure), nearly parallel longitudinal ridges; in others these ridges, except the keel, were not perceptible.

We have not yet traced out the life history of the scale, but from observations made believe that it is probably very similar to that of the New York Plum scale; that is, it passes the winter in the nearly mature stage, the males emerge in late spring; the eggs, which are very numerous and white in color, hatch out in July; the young migrate to the leaves and re-migrate to the branches in the autumn.

This scale has been found at Guelph on the hawthorn and American elm, and at St. Catharines on the peach.

Remedies:

Seldom any need be applied, but the same remedies as are used for the New York Plum scale should destroy this one.

Parasites:

There is a very little doubt that the failure of this scale, laying as it does a very large number of eggs, to increase rapidly is to a great extent due to the attacks of parasites. Dr. L. O. Howard informs us that a chalcid, Chiloneurus albicornis, (How.) attacks it. (Bull. vii, N. S. Div. Ent. U. S. Dept. Agr. 1897, p. 63). This is one of probably a considerable number of parasites.

Kermes pubescens (Bogue).

Kermes pubescens is a large scale resembling the New York plum scale and other Eulecanium scales, but differing in external appearances chiefly in being more nearly spherical. It has been found by us at Guelph, Toronto, and Perth, hence is probably wide spread over the province. Only oak trees are attacked, as it was found in abundance on each infested tree it must do considerable injury. Mr. Bogue, who discovered and named the scale, reports it as attacking the young twigs and leaves, but we have always found it in the cracks of the bark on the trunk and branches and have not yet observed it on very young twigs or on leaves.

The mature female scale is nearly spherical as a rule in shape, though often it seems to be modified in form by its position in the cracks or fissures of the bark.. It is 3-4 mm. long, 3 mm. high, varies in color from light to dark brown, often mottled with black, is shiny in appearance and covered with a short white pubescence.

The male scale resembles very much the male of the New York Plum scale. It is, however, whiter, being snow-white. In shape it is oblong, 2 mm. in length, 1 mm. in width and fairly convex.

The winter is passed by both sexes in the nearly mature stage. The males emerge about the first of June or a little earlier. This year '07 the season was late and they were observed coming forth June 12th. Though the females are fertilized shortly after this we have not yet had opportunity to discover the date when the eggs hatch.

Remedies:

(1) Kerosene emulsion 25 per cent. put on when the trees are dormant should kill the scale. The tree must be soaked, however, to ensure the spray getting into the crevices of the bark where the scales are.

Parasites:

A considerable number of the scales observed had been perforated, evidently the work of a small chalcid fly.

The Cottony Maple Scale, *Pulvinaria vitis* (L.).

The Cottony Maple Scale is by no means a stranger in Ontario. It is found all over the western part of the province at least, and probably over much of the remaining parts also. As the name indicates, it attacks the maple chiefly, and in cities often does much damage to maple shade trees. It is, however, rarely abundant for many seasons in succession, because of the attacks of parasites.

The scale is most easily identified in spring or early summer. At this time of the year it appears as a brown, elliptical, convex insect, with so large a cottony-like egg-mass protruding from behind and beneath that the scale seems to be standing on its head, or nearly so. The egg mass and scale together are about 1 cm. long, the scale itself being about 1-3 of this length. The cottony egg-mass has given the scale its name and makes its identification easy.

The young lice hatch about the middle of June usually, the hatching period extending over a couple of weeks. The tiny insects at once migrate to the underside of the leaf, though some also establish themselves on the upper surface. On the leaves they usually arrange themselves alongside the midrib and veins. About the end of August the winged males emerge and fertilize the females. A few weeks later the females desert the leaves and go back to the branches, where they pass the winter. In the spring of the year they rapidly swell, and in early summer form the cottony mass and lay their eggs in it. Hence there is but one generation in a year.

Although the maple trees are the ones most commonly attacked, the scale is found on many other trees as well. It has been found at Guelph on the following maples: Acer saccharum, A. saccharinum, A. nigrum, A. rubrum, and A. negundo; also on basswood, American elm, hawthorn, white poplar (Populus alba), scrub willow, red-osier, dogwood, ilex (verticillata), Spiræa (salicifolia) and grape vines.

Remedies.

Except in towns there is very little need of using any remedy because parasites keep the scale well in check and, as mentioned above, it is seldom bad many years in succession. In towns, await the hatching of the young, and shortly afterwards prune severely. and where valuable trees are attacked spray these thoroughly with kerosene emulsion, flour kerosene or whale-oil soap. More than one spraying will probably be necessary.

The Oyster-shell Scale, *Lepidosaphes ulmi,* (Linn.) Fig. 25.

The Oyster-shell scale is found in almost every district in Ontario, and is doing more injury to the fruit trees of the province as a whole than any other scale.

The scale can easily be recognized even without the aid of a lens. It is 2.5-4 mm. long, and .75-1 mm. wide in the broadest part, tapers toward the the end, is shaped like a diminutive oyster-shell, and closely resembles in color the bark on which it is found. The small end, or exuvia, is usually much lighter in color than the rest. The male scale differs from the female chiefly in being considerably smaller and broader in proportion to its length.

It passes the winter in the egg stage, from 20-100 eggs being concealed under the covering of a single scale. The eggs hatch about the first week in June. The tiny, white, young scale insects run about for a day or two on the bark or leaves and then insert their sucking tubes in some chosen spot from which they never move during the rest of their life. There is only one brood in a season, but even so, the scales increase very rapidly where no attempt is made to keep them in check. Badly infested trees become much weakened and often die.

Not only does this scale attack apple, pear, plum, and cherry trees, but it also attacks currants, gooseberries, rose bushes, spiræas, lilacs, and numerous shade and forest trees, such as the mountain-ash, hawthorn, red-osier dogwood, black and white ash, American aspen, prickly ash, mulberry, and horse-chestnut.

Remedies.

There are several remedies that can be used with success in combating it: —

(1) Spray with kerosene emulsion, flour kerosene, or whale-oil soap during June as soon as all the eggs seem to have hatched. This date can easily be ascertained by examining carefully, even with the naked eye, a few infested branches. These remedies are the most popular.

(2) The lime-sulphur wash. This remedy, though not so popular as No. 1, has given excellent results when well made and carefully put on late in the spring when the buds are well swollen or are opening.

(3) Whitewash. The trees must be sprayed twice, with an interval of a few days between, with whitewash. This should be done as soon as the leaves fall in the autumn.. Use 1 to 2 lbs. lime to 1 gal. water.

Parasites.—The most common parasites are: (1) A tiny little mite, probably *Tyroglyphus malus*, that preys both upon the adult and the eggs; (2) a small, yellowish chalcid fly, probably *Aphelinus mytilaspidis,* Le Baron, the larva of which preys upon the eggs (scales perforated by small, round holes have been parasitised by this kind of insect); (3) certain species of ladybird beetles, especially the twice-stabbed lady beetle (*Chilocorus bivulnerus*) Muls. This year we found a pink fungus attacking the young scales, and on a mountain ash tree, in Toronto, which was covered with scales, the pink fungus parasitised and killed nearly all the scales on the tree. (See Plate D. Fig. 6.).

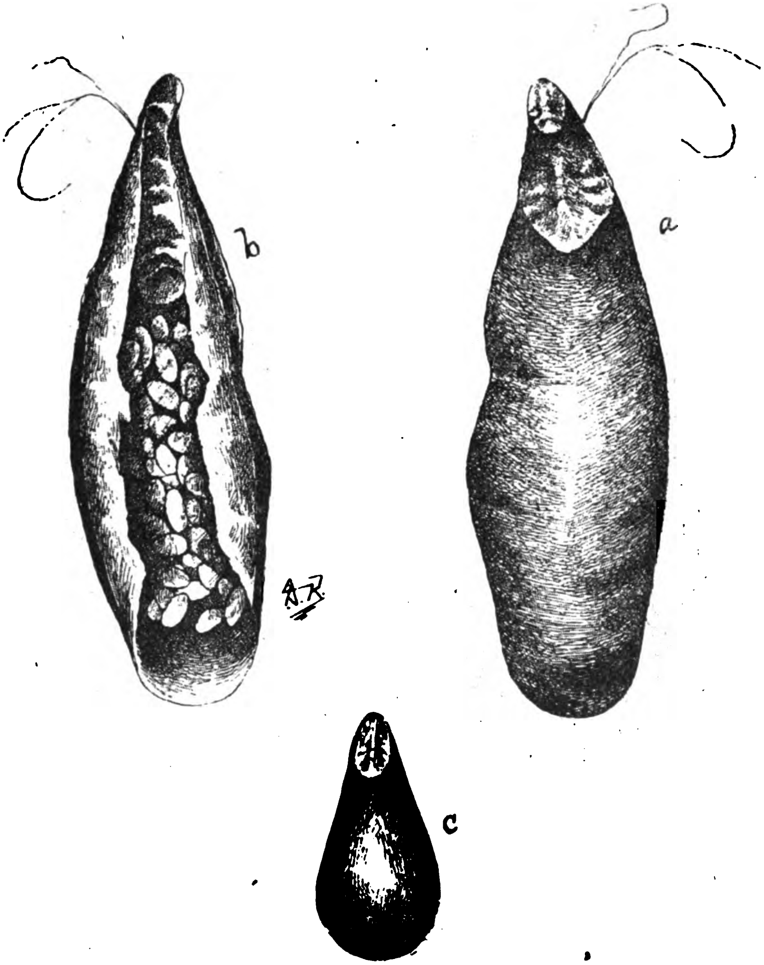

Fig. 25. Oyster-shell Barklouse (*Lepidosaphes ulmi*). (a) Adult female, back view, showing the two moulted skins at anterior end, and the bristles of the sucking tube; (*b*) adult female turned over, showing the insect at the anterior end and the eggs at the posterior end; (*c*) adult male scale, much smaller than female, with one moulted skin at anterior end.

The Scurfy Scale, *Chionaspis furfura*, (Fitch). Figs. 26 and 27.

The Scurfy Scale, though widely distributed throughout Ontario, is seldom found in so great abundance as the Oyster-shell. Badly infested trees or other plants are very much weakened and not infrequently die as a result.

The mature female scale is somewhat of the shape of the Oyster-shell, but is much broader in proportion to its length, and is more properly described as pear-shaped, being 2-3 mm. long, 1-2 mm. wide in the broadest part and tapering rapidly to a fine point at one end. It is very slightly convex and is grayish white in color. The scurfy appearance which it gives to a badly infested branch or twig has evidently been the cause of its receiving its present popular name.

The male scale is very different from the female. It is elongate in shape, is only about 1-3 the length of the female, is whiter in color and has three parallel longitudinal ridges on its back (tricarinate).

The Scurfy Scale has a very similar life history to the Oyster-shell. It passes the winter in the egg stage, there being from 20-80 purplish red eggs under a single scale covering. About the first of June these hatch into tiny orange or reddish brown larvæ, which run about freely for a few hours, and then in some favourable place insert their sucking tube, or proboscis, into the bark, leaf, or fruit and remain stationary henceforth. There is only one generation in a year.

Many kinds of trees and shrubs are attacked by the scale, but the most common are the apple, pear, quince, currant, gooseberry, mountain ash, white ash, hawthorn and horse chestnut.

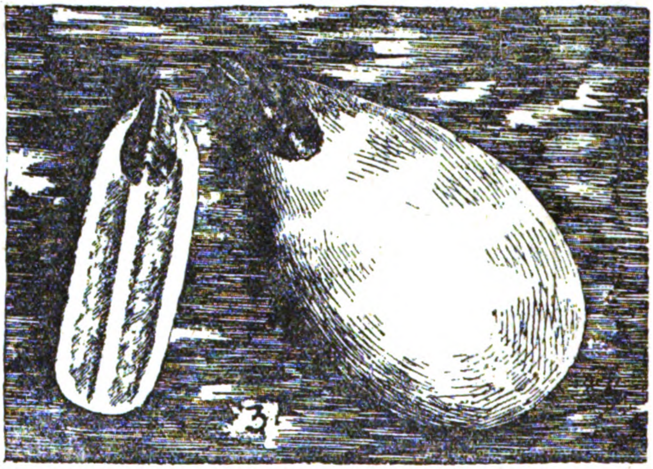

Fig. 26. Scurfy Bark-louse (*Chionaspis furfura*). Adult male and female.

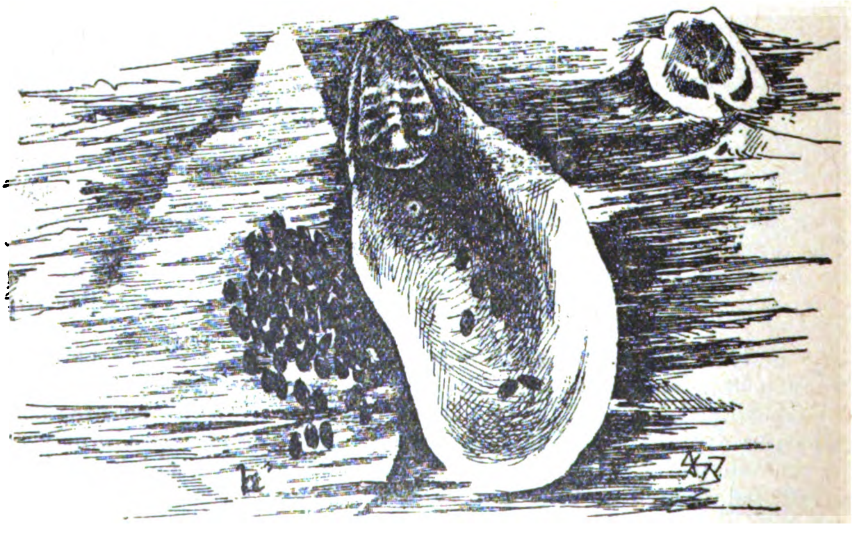

Fig. 27. Scurfy Bark-louse (*Chionaspis furfura*). Adult female, under surface, showing the insect at anterior end, and the numerous purplish eggs.

Remedies.—The same remedies should be used as for the Oyster-shell scale.

Parasites.—The parasites are largely the same as those that attack the Oyster-shell. The most common are (1) the mite, *Tyroglyphus malus* (Schimer); (2) a small chalcid, *Ablerus clisiocampæ,* Ashm; (3) the twice-stabbed lady beetle, *Chilocorus bivulnerus,* Muls.

The Rose Scale, *Aulacaspis rosæ,* (Bouche).

Here and there all over the province we find the Rose Scale attacking rose bushes, and blackberry and raspberry canes. The plants attacked are nearly always in damp, shady places, such as overcrowded gardens, and it is seldom that we find the scale out in open, airy plots.

The mature female scale is nearly circular in shape, moderately convex, 2-2.5 mm. in diameter, almost snow-white, except for a brownish yellow spot, the exuviæ, situated towards one side and extending nearly to the centre.

The male scale is also white, but is very different in shape and size. It is elongate, about 1 mm. in length, 3 mm. in width, and has three parallel ridges running longitudinally along the upper surface.

The scale may pass the winter in almost any stage, from the egg to the mature insect. Breeding goes on almost continuously from the warm days of spring to the severe frosts of late autumn.

Remedies.—From the tendency of this scale to occur almost solely on damp, much shaded plants, the most rational method of treating it is to prune out the bushes so as to let plenty of air and sunlight get access to them. In this pruning, of course care should be taken to cut out the worst infested parts. In special cases, it may be necessary to resort to lime-sulphur, kerosene emulsion, or whale-oil soap, to be applied when the plants are dormant. Invigorating the plant by fertilizers is also helpful.

The Pine-leaf Scale, *Chionaspis pinifoliæ,* (Fitch).

The Pine-leaf scale is very common in many parts of Ontario, and is probably found all over the province. It has not, however, so far as we know, caused any perceptible injury to the trees, although reports from New York state go to show that wherever it is very abundant on a tree it does much damage.

The scale is easily identified from its shape, size, color, and the fact that it is only found on coniferous trees. The female scale resembles to a large degree the Oyster-shell scale in size and shape, but unlike it is seldom curved and is almost entirely snow-white, except for the exuviæ, which are dull colored. The scales are not always of the same shape, some being longer and narrower in proportion to their length than others. This, in many cases, seems to be due to the shape and size of the needles they are situated on. The average length is 2.5-3.5 mm. and the average width .75-1.3 mm. The scale is more convex than the Scurfy Scale and is a little thicker in texture, though not nearly so thick and firm as the Oyster-shell scale.

The male scale very closely resembles the male Scurfy scale, and like it is less than one-third the size of the female scale. It is elongate, about 1 mm. long, 3 mm. wide, snow-white in color and has three parallel ribs or ridges running longitudinally along the upper surface.

The winter is passed in the egg stage. From 20-70 purplish eggs are to be found beneath a single scale cover. The eggs usually begin to hatch about the end of May, but this season were about three weeks later. There are said to be two broods each year, the females of the last brood laying their eggs late in the autumn.

The scale, as mentioned above, confines its attack solely to conifers. We have found it at Guelph on the following pines: White, Bull, Austrian, Scotch, Jack, and Dwarf Mugho, and also on the Norway and White Spruce.

Remedies.—As a rule, there is no need of resorting to any remedy to control this scale as it is seldom sufficiently abundant to do much damage. If, however, it should be found in such numbers as to injure perceptibly trees in a lawn, kerosene emulsion can be used, but this would be impracticable, of course, in any place where there were a very large number of trees to treat.

Parasites.—About one-third of the scales examined this year were found to have been parasitised, apparently by a Chalcid fly. A species of mite was also found preying upon them. Thus it is probable that we owe much of our security against the rapid increase of this insect to these parasites.

THE LIME-SULPHUR WASH.

By L. Caesar, Ontario Agricultural College, Guelph.

From time to time during the last two years questions have arisen in connection with the lime-sulphur wash which have made the Entomological department feel that there was need of a further study of this important mixture in order that they might be able to give fuller and more definite information to fruit-growers. Accordingly Dr. Bethune and Mr. Jarvis, not having an opportunity themselves to devote their attention to this subject on account of the mass of other work to which they have to give their time and energy, asked me to begin the investigation this year.

After reading the best literature I could find on the subject and getting valuable suggestions in this way, I began to make the mixture on a small scale in the chemical laboratory, where I could use glass vessels and see the different phases passed through, so far as there was any physical evidence of these. It was my intention at first to attempt to study the chemistry of the wash, but I soon found that this would make a whole season's work and that in any case the field experiments were necessary first to show what chemical problems there were. This autumn Professor Harcourt of the Chemical department informed me that his department intended, if possible, this winter to study the chemical side of the wash. He asked me to let him have a list of any chemical problems that had occurred to me in connection with my work on it during the season.

After some laboratory experiments I began my field experiments. Any experiments, however, made at Guelph alone would be inadequate, because we have no San José scale here, and because we are also free from a number of plant diseases that are very troublesome in the more truly fruit-growing districts of the province. Hence, I determined to make a trip to the Niagara district in the spring when the wash was being applied to the trees, and again in the fall to see the results, and to interview the best fruit-growers to find out their experience with the wash. I tried, moreover, whereever possible, to supplement my own experiments by visiting particular orchards in other districts or communicating with men who were using the spray. In these ways considerable information about the wash has been obtained, although I am aware that it will require further experiments for two or three years longer before we shall know all that we should about this mixture.

I shall not attempt to give any account of the details of the experiments made, but rather will discuss the different points of interest in succession. Before proceeding to deal with these points, I should say that it was not merely a few trees that were sprayed with the mixture at Guelph; almost 600 gallons of the spray were put on. Each tree was carefully done but was only sprayed once.

WHAT FORMULA SHALL WE USE?

One of the first points of interest is to determine what formula is most satisfactory. While this is an important matter, yet there is room for a considerable amount of freedom. In countries like California and some other American States where there is very little rain, a weaker mixture than will suit our conditions may be used with good results. I found that the chief objection to using a formula as weak as 15 lbs. lime, 12 lbs. sulphur and 40 gallons water was that the spray was washed off the twigs too quickly by the spring rains. It is very important, however, that the spray should remain on all parts of the tree as long as possible. The lowest formula that seemed to me satisfactory, from my own experiments and those I observed elsewhere, was 20 lbs. lime, 15 lbs. sulphur and 40 gals. water. This formula has given excellent results. For instance, Mr. W. H. Bunting, of St. Catharines, one of the most successful fruit-growers, has used it for some years, and though the San José scale has been in his orchards for a long time and is very bad in neighboring orchards, he keeps it under complete control with lime-sulphur of the above strength. Many farmers, however, prefer to use a slightly stronger wash. The majority of those I met in the St. Catharines district used 22 lbs. lime, 18 lbs. sulphur and 40 gals. water. This is also about the average strength used at Grimsby, Winona and Fruitland. There is no trouble whatever in spraying a mixture as strong as this or even stronger, as I myself proved. New nozzles of the type of the "Friend" allow such mixtures to be put on in a fine mist without any trouble from clogging. There can be no objection then to a fruit-grower using a mixture of this strength or even stronger except that where spraying is done every year 20 lbs. lime, 15 lbs. sulphur and 40 gals. water give practically as good results and the expense is considerably less.

FIRST STEPS IN BOILING.

Having decided then that 20 lbs. lime, 15 lbs. sulphur and 40 gals. water shall be the minimum strength, let us next consider the best way to go about making the wash. After testing several ways, I found none more satisfactory than the following: put about 13 gals. (about one-third of the total 40 gals.) of boiling water into the barrel. Turn off the steam and at once put the 20 lbs. of lime into the water. (Care must be taken to use only fresh unslaked lime). When the lime has begun to slake vigorously add the sulphur, which should have been made into a thick paste with boiling water before the lime was added. The whole should now be stirred as well as the boiling will permit. When the boiling begins to slacken, turn the steam on again. Stirring should be repeated every five minutes or so in order that any little lumps of sulphur may be more readily broken up and go into combination. Boiling must always be vigorous, so vigorous as to keep the contents of the barrel in constant commotion and cause the liquid to splash up to the top.

HOW LONG TO BOIL.

One set of experimenters used to say that boiling should be continued until the deep green color came, others said to boil until the orange or amber shade was reached. When Prof. Harcourt and I visited the St. Catharines district last spring and saw the dirty, dark green color characteristic of most of the spray that was being used, we both remarked that we could not possibly get such a color with our Guelph lime. On our return I procured, with Prof. Harcourt's assistance, a bushel of lime from Port Colborne and another from Beachville. Laboratory tests were made with each of these, and with Guelph and Caledon limes, to see what color of wash would be obtained from each kind. The results were interesting. Port Colborne lime gave a dirty dark green, Beachville a greenish orange or greenish yellow, Guelph was slightly lighter in shade, Caledon gave a green but one considerably lighter than that from Port Colborne lime. Each kind of lime was boiled for one hour under as nearly as possible exactly similar conditions. The formula used was 22 lbs. lime, 18 lbs. sulphur and 40 gals. water. Hence it is quite clear that the color obtained depends solely upon the kind of lime used. For general directions, therefore, it is not possible to say what color must be reached. The best way is to boil *vigorously* for one hour. By the end of this time all the sulphur will have entered into combination with the lime and further boiling will not make the wash more effective. It should be remembered that if the barrel is nearly full or even half full of water, it will not boil quite so rapidly as if there were only about 13 or 14 gals. of water in it.

Is it Necessary to Use any Special Kind of Lime?

Whether the lime of one's own district will give satisfactory results or not is an important question. There is very little doubt that the lime with a high percentage of calcium in it is more desirable than a lime like that of Guelph, containing nearly 40 per cent. of magnesium.

This element will not unite chemically, to any extent at least, with sulphur, and hence to some degree weakens the wash. However, I have found that even Guelph lime will give good results though not quite so good as Port Colborne or Beachville lime. Of these latter two, Port Colborne was the more convenient to use, because the wash made from it stands up better than any other I have experimented with, and so requires less agitation in the field. If any one is in doubt about the spraying value of his lime, he could easily have it tested by forwarding a sample to the Chemical department, but there is little question that good results will be obtained from almost any kind of lime. It is always easy to send for a bushel of some known lime like Port Colborne and compare results with those from the home lime.

The Dilution of the Mixture.

Many farmers dilute with cold water, but it is more desirable that hot or warm water be used so that the spray will be put on fairly hot. There are several reasons for this: (1) It is easier to spray with a warm than a cold mixture because the nozzle is less likely to clog. (2) The spray penetrates crevices and covers the bark better if put on hot. (3) If the mixture is allowed to cool there is a danger of certain substances crystallizing out in the form of tiny orange needles. This fact suggests that, if for any reason the mixture is left over night, it will be necessary to reboil it for a short time to bring these crystals into solution again. A convenient method that I have used is to dilute with cold water and then turn on the steam for a few minutes to heat the barrel up a few degrees before transferring the mixture to the spray tank.

DEVICES FOR BOILING.

Much the handiest and cheapest method of boiling is that a number of farmers should club together and hire a man to boil for them with a steam-engine. An ordinary threshing engine is generally used. An engine of this sort can be so adjusted as to boil from eight to ten barrels at once. A number of farmers have small upright steam generators, each of which costs about $125. This is a very satisfactory method of boiling. Many farmers, however, are doing excellent work with ordinary large iron kettles, each holding about 20 to 25 gallons. These are either placed in a brick arch or are enclosed by sheet iron so as to concentrate the heat and prevent the wind from blowing the flames in every direction. One enterprising young Englishman had no engine or kettle, so he made a tight-fitting box of planks about 6 x 4 x 1½ ft. in size and covered the bottom and sides of this with sheet-iron to prevent the wood from catching fire. A small foundation about a foot high was built for the box to rest upon. An opening was left in the front of this to throw fuel in and a stove pipe arranged at the other end to draw off the smoke and create a draft. Upon the box a cover was placed of boards nailed together but with an opening along the centre to work a hoe in to stir the liquid. This simple device worked splendidly and good mixtures were made by it.

It is perhaps unnecessary to say that very few of the fruit-growers are to-day using the self-boiled method of preparing the wash. It has not given nearly so good satisfaction as the other method.

THINGS TO OBSERVE IN SPRAYING.

One often hears a great deal about the unpleasantness that accompanies the use of lime-sulphur. Much of this objection can be removed by attending to the following points: (1) Every precaution should be taken to choose as convenient a place as possible for making and loading the spray. This place should not be allowed to become muddy. The use of a few boards and the digging of a little drain if necessary can usually remedy this defect. (2) Spraying should be done only with and never against the wind. (3) Long hose should be used so that the driver and horse need not be brought close to the tree, and so may escape getting covered with the spray. (4) Workmen should be provided with suitable gloves to protect their hands. (5) A nozzle that will not easily clog, such as the "Friend" or "Simplex" should be used. Of course the spray should be carefully strained before it enters the tank.

To give satisfactory results good, careful spraying must be done. A day or two after an orchard has been sprayed, the spray-wagon should be taken over it again and any twigs or branches that have been missed can then be clearly seen and sprayed. Unless every part of the tree is drenched, the best results cannot be obtained. Some fruit-growers take so much care to see that every tree is thoroughly done that they even go through the orchard a third time to touch up any poorly sprayed places.

THE BEST TIME TO SPRAY.

I have not yet had a chance to test the merits of fall spraying. It is well known that it does not meet with so much favor as spring spraying. There is no doubt, however, that if a man knows that for some special reason he is likely to be unable to spray in the spring, he should by all means do so in the autumn as soon as the leaves fall. Of the spraying that is done in the spring my experience leads me to give a decided preference to that which has been put on when the buds were actually bursting, compared with what was sprayed a month earlier. I find that the longer the wash remains on the trees the better the results. Now a spray put on a month before the leaves come out will wash off much more rapidly than that put on when the buds are opening, for the simple reason that, in the latter case, the leaves coming out soon after, break the violence of the rain and to a very considerable extent protect the spray. Many other experimenters have found the same result. In Bulletin No. 107 of the year 1906, Prof. Forbes, of Illinois, says, that January applications were only about half as efficient as those made in March. Allowing for difference of climate this would be practically the same thing here as spraying in March compared with the end of April. I found that trees sprayed for Oyster-shell scale on March 9th seemed to be but little benefited, whereas a very large per cent. of the scale was killed on those sprayed on May 10th, that is two months later. In every case where I examined trees for either Oyster-shell or San José scale I found that those on which the wash had remained longest showed much the best results; and, other things being equal, these were always the last sprayed trees.

But some one may ask, "How late is it safe to spray?" Personally I think it is perfectly safe to spray until the buds are nearly open. I sprayed a few currant bushes when the leaves were nearly an inch wide, and there were scarcely any signs of injury to the foliage. Apple and plum branches were also sprayed when the buds were almost open; a very slight sign of their having been burned in some cases around the edge was all the injury I could detect. I have seen a number of plum trees sprayed when the buds had practically burst and yet no injury resulted. In the Niagara district I made a number of inquiries on this point and in every case got the answer that it was quite safe to spray even while the buds were actually bursting. Peach trees, having a very tender foliage, should not be sprayed quite so late as more hardy trees. I found that a number of the farmers next year think of spraying, as an experiment, a few trees just after the blossoms have fallen. Their object is to see the effect upon aphids, plum rot, and apple and pear scab. Mr. J. W. Smith told me of an interesting experiment that had been performed by his tenant, Mr. R. Doughbrough, on Mr. Smith's farm at Vineland. I called on Mr. Doughbrough and asked him for further information. He said he had sprayed some pear and plum trees this spring just after the blossoms had fallen. He used the full strength 22 lbs. lime, 16 lbs. sulphur and 40 gals. water, boiled for 45 to 60 minutes.

The foliage, he claimed, was practically uninjured and was equally as good as that on trees sprayed earlier in the spring. The results upon the scab will be referred to later. Though Mr. Doughbrough was able to spray so late this year without injury, it is very probable that a difference of weather would have caused the spray to burn the foliage severely. Therefore, while it is advisable to spray as late as is safe, all spraying should cease before the blossoms come out. In any case the blossoms and leaves would prevent the spray from covering the bark of the tree thoroughly and so scale or other hibernating insects could not be so effectively controlled.

The Effect of Rain.

The question has sometimes been asked whether, if rain comes after spraying, it will be necessary to spray again. The best answer to this question is that those who have any doubts about the rain having injured the spray should examine the trees a day or two later and see whether it has been washed off. If it has, the bare twigs or branches should be given another coat of the mixture. I sprayed a few trees purposely during a moderately heavy shower to see the effect. A day or two afterwards I examined them and found, as I expected, that there was very little of the spray on them. Some other trees, however, had been sprayed an hour before the shower began and had had time to become dry; these were not visibly affected by the rain and sleet. It stands to reason, moreover, that one should not spray immediately after a shower but should wait until the trees are dry. Before leaving this subject it is perhaps well to remove the misconception that at least some mixtures of lime-sulphur, once they have become thoroughly dry, are scarcely at all affected by rain. On one occasion this spring I investigated this point during a fairly heavy rain. Some of the trees had been sprayed with Port Colborne lime, others with Beachville, others with Guelph. In some cases the wash had been boiled 45 minutes, in others 60, in others 90, and in others as long as 3 hours. In every one of these cases lime was quite visible in the large drops on the underside of the twigs and branches. So that the length of time the wash remains on (one season compared with another) depends to a large extent upon the amount of rain that has fallen. In a very wet spring it is quite probable, therefore, that the efficiency of the lime-sulphur, while not entirely destroyed, would be greatly lessened.

How the Spray Kills.

It is very difficult to say just how the spray kills. Chemists have found that as a result of the chemical reactions that are constantly taking place on the tree, minute particles of sulphur are being constantly set free. Sulphur is known to be not only a good fungicide, but also an insecticide and it is possible that many of the insects like the San José scale, which have a thick covering to protect them, are killed by inhaling the sulphur which would naturally permeate everywhere, even beneath the scale. At any rate sprayed branches examined by me this year showed that by June 8th the San José scale insects were nearly all dead beneath their covering. In many cases the direct caustic nature of the wash seems to be the cause of death, e.g., of freshly hatched aphids. In others, such as the Oyster-shell scale, the wash seems to harden around the scale and prevent the young from hatching or from emerging after hatching. Under the same scale coverings of this insect I have found some of the eggs unhatched and others hatched but the young larvæ lying dead as if unable to escape. Of course it is very probable that some sort of caustic action also helps in destroying this scale. I have noticed that the scales are nearly always more brittle and so more easily removed on the sprayed trees than on the unsprayed; so that the eggs may to some extent be exposed to the weather and thereby destroyed. The same thing may hold true of the San José scale insects. I have not found, however, that a very large percentage of deaths is due to the scales being loosened and falling from the trees. Not more than three per cent., I think, of the Oyster-shell scale were destroyed in this manner. Later on in the season, however, the old dead scales on the sprayed trees began to peel off and leave the bark fresh and clean. Probably one of the most effective ways in which the wash acts as an insecticide is in keeping the bark covered and either making it difficult for the young scale insects to find a suitable and attractive place to settle down and insert their sucking tubes, or else making it impossible for them to insert them at all.

The fungicidal value of the wash is probably due, first to the sulphur and certain sulphur compounds which are well known to have a fungicidal value, and secondly to the covering left on the tree acting as a means of preventing spores from finding so favorable a lodging place as they otherwise would. The spray that falls on the dead leaves on the ground beneath the tree must do much to destroy spores that are hibernating there. We cannot, however, say definitely just how the wash gets its full insecticidal and fungicidal value.

KINDS OF TREES AND SHRUBS THAT MAY BE SPRAYED.

Many fruit-growers are using this wash now on every kind of fruit-tree and shrub, even on raspberry bushes. A few are using it on grape-vines but this is unusual. It has no known injurious effect upon any of these plants.

RESULTS UPON INSECTS AND FUNGUS DISEASES.

In discussing the results of the spray, I shall take up its effect upon insects first and then upon fungus diseases and upon the general health of the tree.

THE SAN JOSÉ SCALE.

It seems hardly necessary to discuss the effectiveness of the lime-sulphur wash against the San José scale. There is none of this scale at Guelph, hence I had to rely upon my own observations elsewhere and upon the testimony of reliable fruit-growers for my information, on this point. I shall mention a few cases simply by way of illustrating that the wash will most effectively control this terrible pest. In the St. Catharines district the fruit-growers who have carefully and systematically sprayed their trees with this wash are not at all afraid of the San José scale, whereas those who never spray or carelessly spray are rapidly losing their trees by its ravages. Such men as the latter class explain the success of their neighbors on the ground that Heaven is kind to some people while others never have any luck. But let us take the case of Mr. Bunting, president of the Fruit-growers' Association of the St. Catharines district. On one part of his farm there were four or five rows of pear trees that had been sprayed with Scalecide at the strength of one part to fifteen of water. Nearby in the same orchard were several acres of peach trees that had been sprayed with lime-sulphur. As I walked along between the rows of pear trees and looked at the fruit on the ground, I saw that nearly every pear showed numerous red spots, which said more plainly than words that they were badly attacked by the San José scale. In the peach orchard, however, I sought in vain for some time to find a single scale. Mr. Bunting said there were some left but so very few that one often had to look a long time to find any. Another example of the effect of the wash was seen at Mr. Doughbrough's farm at Vineland. On this farm the lime-sulphur had scarcely been used at all until this year. The rapid increase of the scale, however, caused Mr. Doughbrough to try the wash this season on all infested trees. Last autumn several trees were so badly weakened by the scale that it was thought they would die. It was decided not to cut these down this spring but to keep them as a special test of the merits of the wash. Accordingly each tree was very carefully sprayed. The results surpassed the hopes of Mr. Doughbrough. On all the trees but one there was hardly a scale left and this one had fewer than the previous year. Furthermore the foliage was vigorous and the trees bore almost an average crop of fruit. It is unnecessary, however, to mention other examples that could easily be given from any farmer who has carefully used this wash against the scale. The fact is that wherever a man says he has not got good results against the San José scale from the use of lime-sulphur, it will turn out on close investigation to have been due to some fault in preparation or manner of application. The wash is at present the cheapest and most effective remedy for the San José scale in Ontario.

THE OYSTER-SHELL SCALE.

If we take Ontario as a whole we shall probably find that more injury is being done at present to fruit-growing by the Oyster-shell scale than by the San José, simply because the former is abundant in almost every orchard while the latter is limited to only a few districts. Consequently a good remedy against the Oyster-shell scale would be a great boon to the province. Whether one year's experiments are enough to decide this question is a matter of some doubt. I have endeavoured to make my experiments sufficiently extended to draw accurate conclusions. I have also visited several apple orchards in different parts of the province to compare results. It has been more difficult, however, to determine the effect of the wash definitely than one would have thought. The reason for this is, that owing to the cold, backward spring and the unfavorable weather which followed soon after the hatching of the eggs a very large proportion of the young scales, even on unsprayed trees, died before reaching maturity. When there were so many dead scales it naturally required much more careful work to determine accurately the effects of the wash. I found that on the trees that were sprayed before the middle of April almost all the eggs hatched out; on those sprayed about the middle of April much fewer, and on those sprayed in May when the buds were bursting, only a small percentage hatched. In other words wherever the wash remained well on the tree and covered it, there were very few eggs hatched compared with the cases where it washed off before the hatching season. Not all the eggs, however, on any tree were killed. I found practically the same results in other orchards. But some farmers, whose orchards I had not a chance to visit, reported that the wash had been useless. I think the majority of fruit-growers who have tried lime-sulphur only once or twice for the Oyster-shell scale have not been satisfied with the results. I believe the reason for this is largely that they sprayed too early in the spring and did not cover the trees so thoroughly as they should; in short they did not drench the trees from top to bottom. Had these points been attended to they would have killed a large percentage of the scale, though not all in one season. I have observed that where orchards are sprayed every spring for a number of years in succession there are practically no Oyster-shell scales left. But it is not enough to examine the trees soon after the eggs have hatched; they should also be examined later in the season to see what proportion of the young larvæ has matured. I find that on the trees that showed the most successful results in July, it is difficult to discover a single living scale this autumn. Yet one should not draw inferences rashly from this condition of affairs; for as I have mentioned above a very large percentage, apparently as high as 75 per cent. of the young scales died even on the unsprayed trees here this year. If then we are to judge by the earlier results we can only say that lime-sulphur is not a perfect remedy for Oyster-shell scale if it is only to be applied once; but that if it is put on late in spring and repeated for several years in succession it gives excellent results. For a single application I believe kerosene emulsion or flour-kerosene put on when the eggs have just hatched gives better results. Whitewash applied twice in the autumn after the leaves have fallen is said to be an excellent and cheap remedy.

THE NEW YORK PLUM SCALE.

All the scales of this species which were covered with the spray were killed and shrivelled up. As these insects hibernate chiefly on the underside of branches and twigs and are sometimes found in great abundance on this part of the lowest branches, great care should be taken to see that the spray is forced up through the tree from beneath as well as driven in from the side or allowed to fall upon the branches from above.

THE PEAR-TREE PSYLLA.

I asked the opinion of those farmers who have tested the effect of this wash upon the Pear-tree Psylla. The most definite information I got on the subject was from Mr. E. M. Smith, of Winona. Mr. Smith was one of the first men in the district to begin using lime-sulphur. It occurred to him one year that the wash might destroy the Psylla, so he made a special test. A certain plot of pear trees were sprayed with lime-sulphur, and another plot equally bad with the Psylla was left unsprayed. The result was such as to convince him most strongly that the wash would destroy this insect.

APHIDS.

Whether the lime-sulphur will destroy aphids' eggs and thus control the aphid pest is a much disputed question. Some of the fruit-growers think it will, others think not, but none whom I met could give definite information. In some of my own experiments this year the aphids had already hatched and were on the ends of the opening buds; some also had worked their way in among the tiny bud leaflets. About 50 per cent., as nearly as I could tell, were destroyed by the wash. Only those died that the spray had actually fallen upon. Those that were in among the leaflets of the bud were of course safe, and in spite of the most careful spraying some of the others failed to be hit. On trees that had been sprayed before the hatching of the eggs, I found it impossible to determine the effect on the eggs simply because there were scarcely any eggs to be found. In order to test this point better, a tree with numerous eggs on the twigs was sprayed this autumn on November 23rd, but it is not possible to determine the results in time for this paper. A number of good entomologists tell us that the wash does destroy the aphid eggs. Every one should test this for himself, and if it prove to be true in our climate as well as in the United States, it will be another strong argument in favor of using lime-sulphur.

THE BUD MOTH.

The part of the orchard which I sprayed in May was the part where the Bud Moths were worst. So far as I could see from comparing sprayed and unsprayed trees very few of these insects were killed. It is probable that all the larvæ were already out of their winter cases and were in the bursting buds and so escaped the spray. There is need of further experiments to determine the effect upon this pest.

THE CODLING WORM.

As a result of spraying with Paris green there are very few Codling worms in the College orchard; hence I could not determine the effect of the wash upon them. It is difficult to see how these insects could be injured by the spray, yet some American Experimenters state that the wash does a good deal to control the Codling worm. The only case that I know of which would tend to show that the wash may greatly lessen the number of codling worms was at Fruitland in one of Mr. Tweddle's orchards. For some cause Mr. Tweddle sprayed about an acre of apple trees at one end of the orchard and situated just at the base of the mountain; the rest of the orchard was not sprayed with lime-sulphur, although both parts were sprayed with poisoned Bordeaux mixture later in the season. When I went through the orchard in September there were scarcely more than half as many wormy apples in the sprayed as in the unsprayed part. Mr. Tweddle attributes this result to the lime-sulphur. Possibly this was the case, but it would be necessary to make sure first that the later spraying with poisoned Bordeaux mixture had not been put on at exactly the proper time in this part and a little too late in the rest. Mr. Tweddle intends to make further experiments on this point next year. It is certain, however, that whatever benefit in this respect may be obtained, the wash will not completely control the codling worm; for in several orchards where it was used there was a very large proportion, about 50 per cent., of wormy apples.

PEACH LEAF-CURL.

The evidence in proof of the lime-sulphur as a reliable preventive of Peach Leaf-curl is practically overwhelming. If any one has any doubt on the matter I refer him to such well known fruit-growers as Messrs. J. W. Smith, of Winona, Robert Thompson and W. H. Bunting, of St. Catharines. These and many other successful fruit-growers can, from their own experience, convince any man who is willing to be convinced.

GOOSEBERRY MILDEW.

It is well known that the chief difficulty in growing English gooseberries in America is that they are very subject to attacks of mildew, which practically destroys the leaves and fruit. Three years ago, almost by accident, Mr. Joseph Tweddle, of Fruitland, sprayed his English gooseberry bushes with lime-sulphur and was pleasantly surprised to find them comparatively free from mildew that season. Next year, and again this year, he has used the same wash with the same good results. This year Mr. E. D. Smith, of Winona, tried lime-sulphur on his bushes and agrees with Mr. Tweddle in saying that so far as their experience has gone the lime-sulphur makes the growing of this class of gooseberries both possible and profitable. Other fruit-growers in the Niagara district who have heard of these results told me they intended trying the experiment next year. Should these experiments turn out in the way it is expected no small benefit will accrue to the fruit-growers of the province.

PLUM ROT.

Very few plums rotted this year, hence the effect of the lime-sulphur upon plum rot cannot to any appreciable extent be determined by this year's experiments. The general consensus of opinion, however, among those who have used the wash on their plum trees for several years, is that it has considerably lessened but not entirely prevented the disease.

PEAR SCAB.

An interesting experiment to determine the effect of lime-sulphur upon the Pear Scab, when applied much later than usual in the spring, was made by Mr. Doughbrough, of Vineland. Mr. Doughbrough, as I have mentioned above, sprayed some pear trees with lime-sulphur after the blossoms had fallen. These trees had been badly affected with Pear Scab the previous year. Some nearby trees were left unsprayed. The result was that the fruit on the sprayed trees was very much cleaner than on the unsprayed. He said that one could tell by a glance at the gathered fruit which belonged to the sprayed trees, and which to the unsprayed. I have not had an opportunity of finding the effect upon the disease of spraying at the usual date.

I have not been able in this one season to deal with all the problems that have suggested themselves to me in my study of this very useful spray. There are many fungus diseases yet upon which I have either no information or none that is valuable; for instance, apple scab, shot-hole fungus, and powdery mildew of cherry. Moreover the effect upon many insects and insect eggs has not been dealt with. No one orchard, probably no one district, affords an opportunity to make experiments upon all of the fungus diseases and insect pests which are to be found in this province. To get as full information as is desirable experiments must be carried on for several years and by several persons in different localities. The first year's work, though quite valuable in direct results, is perhaps even more valuable in showing what problems should be investigated and how to go about their investigation.

In conclusion there are a few points that should be mentioned: (1) It is clear that the trees treated with lime and sulphur ought to show a more thrifty appearance as a result. This was very conspicuous in many orchards and my attention was frequently directed to it by the fruit-growers. (2) No person should think that because lime-sulphur is such an excellent wash he need use no other spray. It must not be forgotten that lime-sulphur is only meant for a spring or fall wash and there are many fungus diseases and insects that can only be controlled by the use of a summer wash in addition. Poisoned Bordeaux mixture is, therefore, necessary to supplement lime-sulphur. In the careful use of these two spray mixtures lies the secret of much of the success of our best fruit-growers.

AN UNUSUAL OUTBREAK OF HALISIDOTA CATERPILLARS.

By **Arthur Gibson**, Assistant Entomologist, Experimental Farm, Ottawa.

One of the interesting outbreaks of the season of 1907, has been the unusual number of the caterpillars of two Halisidota Tussock Moths, viz., the Hickory Halisidota, *Halisidota caryæ*, Harr., and the Spotted Halisidota, *Halisidota maculata*, Harr. We have no record of these insects being so abundant and destructive in Canada, as they were during the past season. In the United States, the Hickory Halisidota Tussock Moth has, on several occasions, being recorded as doing much damage in limited localities. During the present year the Hickory Halisidota while numerous and injurious in Ontario and Quebec, was particularly destructive in the Maritime Provinces. The Spotted Halisidota, on the other hand, while also troublesome to some extent in Ontario and Quebec, was specially reported as doing harm in Manitoba and Saskatchewan. In the Ottawa district, both of these caterpillars were decidedly more in evidence than is usual and their work could readily be seen, chiefly on elm and basswood trees.

Many specimens and reports of injury by these insects have been sent in. The following extracts from some of the letters received at the Division of Entomology, will give an idea of the extent of the infestations.

The Hickory Halisidota Tussock Moth.

Weymouth, N.S., August 15. "The caterpillars which I sent you on the 7th inst., and which you identified as those of the Hickory Tussock Moth, are very numerous on alder trees. To-day I noticed several trees which were covered from top to bottom with these caterpillars. I also found them on an apple tree, hundreds on a leaf." M. G. DeWolfe.

North Range, N.S., August 16. "I send you some caterpillars which are attacking the beech trees here. They move about from one limb to another. I am also told that they are on the apple trees near by, as well as on the beeches." F. V. McNeill.

Smith's Cove, N.S., August 15. "I am sending you some caterpillars. Please tell me what they are as they are eating the trees very badly. They are mostly on hardwood trees, birch and beech, but apple trees are also being injured." G. W. Potter.

Bear River, N.S., August 21. "Am sending you a small box containing samples of caterpillars that are numerous in some sections of Digby County. Please tell me what they are and give me a remedy for them." B. C. Clarke.

The Spotted Halisidota Tussock Moth.

Lancaster, Ont., August 28. "I found a large number of caterpillars, such as the one I am sending, on apple trees." A. G. McBean.

Brome Centre, Que., August 31. "I am sending a species of caterpillar which has been very numerous and very destructive here." H. H. Millar.

Brandon, Man., Sept. 13. "I am sending you some specimens of a caterpillar which I found quite common in many tree plantations during the past two weeks or more. This caterpillar is found most frequently on the Manitoba maples. I have also found it on Russian poplars, and some of the bush fruits, such as gooseberries and currants, are infested to quite an extent." F. W. H. Jacombe, Inspector of Tree Plantations, Dominion Forestry Branch.

Yellow Grass, Sask., Sept. 13. "The caterpillars which I send have been doing considerable harm by eating the leaves of ash-leaved maples." J. J. Odell.

Barronsfield, N.S., Sept. 16. "I send a caterpillar which seems very destructive. One Manitoba maple tree noticed particularly was completely covered with them." J. H. Seaman.

Mount Hebron, N.B. "I enclose a caterpillar which is abundant on apple trees in this vicinity." H. H. Biggar.

At Rostrevor, on Lake Rosseau, Muskoka, Ont., where I spent the first three weeks in September, the larvæ of the Hickory Halisidota were very abundant. In the rich woods of maple, birch, etc., near by, the caterpillars, which were wandering around in search of winter quarters, could be seen at almost every step. The Spotted Halisidota was also present at Rostrevor, but was not nearly so abundant. Such larvæ of the latter as were seen were all on alder.

From the above quotations, it will be seen that the abundance of these insects in 1907 was much commented upon and caused considerable anxiety. Fortunately, however, these caterpillars appear late in the season and, for this reason, their injuries were not of such a serious nature as they would have been had the habits of the larvæ been different and the outbreak occurred in June or early in July, when the trees were making most growth.

The caterpillar of the Hickory Halisidota and that of the Spotted Halisidota are very different in appearance. The body of the former is clothed with dense tufts of white hairs, with a ridge of black hairs down the centre of the back, and two pairs of long black pencils on the 1st and 7th abdominal segments, while that of the latter is covered with tufts of bright yellow and black hairs, the black tufts being on the four anterior and three posterior segments and the yellow tufts on the remaining segments. The latter are centered down the middle of the back with a row of black spots. The larva of the Hickory Halisidota is slightly the larger of the two, measuring when full grown about an inch and a half in length.

Both caterpillars are general feeders, being known to attack a great many different kinds of plants. At Ottawa, we have found the larvæ of both species chiefly on elm, basswood, alder, willow, oak and ash. In his "Insects Affecting Park and Woodland Trees," Dr. E. P. Felt says that in New York State the caterpillars of the Hickory Halisidota show a decided preference for walnut, butternut and sumac. The larva of the Spotted Halisidota Tussock Moth is chiefly recorded as an oak-feeding species, in fact it is referred to by some writers as the Oak Tussock Caterpillar. When disturbed, both of these larvæ have the habit of falling to the ground and curling up, in which position they may remain for some little time.

When these two kinds of caterpillars become full grown in autumn, they wander about in search of suitable places to make their winter homes, and when such are found each larva spins an oblong oval cocoon composed of the hairs from its body. The cocoons of both species are of the same size, averaging a little over ¾ of an inch in length by about ½ an inch in width. They are different in colour, however, and owing to this can be easily separated. *Halisidota caryæ* has a cocoon of a uniform ashy gray colour, while the cocoon of *Halisidota maculata* is of a decided yellow, from the bright yellow hairs from the larva showing up among the black hairs, also from the body of the caterpillar. In some specimens of the latter the yellow is more intense than in others, this of course being caused by more than the usual number of the yellow hairs on the larva. At the present time these cocoons can be readily found in open woods, etc., under pieces of old plank, dry logs, or even stones. On October 8th of the present year, I collected 13 cocoons of the Hickory Halisidota, fastened to the underside of a small piece of board. This was near a large basswood tree on which the larvæ had been feeding. Many other cocoons occurred near by.

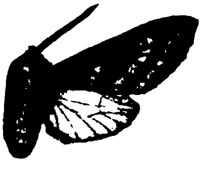

Fig. 28. The Hickory Halisidota Tussock Moth.

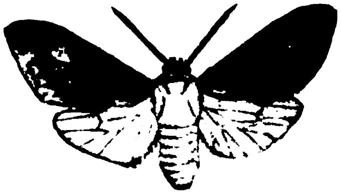

Fig. 29. The Spotted Halisidota Tussock Moth.

Soon after completing its cocoon the caterpillar changes to a reddish-brown pupa, the moths emerging the following June. The Hickory Halisidota Tussock Moth (Fig. 28), measures when the wings are expanded from

1½ to nearly 2 inches. The ground colour of the forewings is ochre-yellow, but is heavily dusted with brown scales. On the forewings are five, more or less, transverse bands, or rows of spots joined together. The outer two rows of these are pearly, the others mostly the ground colour of the wings, edged with brown. The hind wings are paler, semi-transparent, and without any markings. The body is about the same colour as the wings, the shoulder covers of the thorax being margined with brown on the inside. The male differs from the female in being rather smaller and in the antennæ being more pectinate.

The Spotted Halisidota Tussock Moth (Fig. 29), is a more conspicuous looking moth. The forewings are also ochre-yellow, but are spotted with blotches of dark brown, the outer of which forms a distinct band across the wing. The other blotches form four partial transverse bands, the 2nd, 3rd and 4th of which, in most specimens, join in the centre of the wing, forming one large blotch. The hind wings are the same as those of *H. caryæ.* The body is of much the same colour as the forewings, and just behind the collar are two oblique stripes, which converge and almost form a V-shaped mark. In width of wing expanse, this species averages slightly more than the first named species. The same differences occur between the males and females.

As mentioned above, the caterpillars of these two Halisidota Tussock Moths only appear late in the season, but, if another year they should again occur in such numbers on trees of value which it was thought should be protected throughout the whole season, they could, of course, be easily destroyed by spraying the trees with a poisonous arsenical spray, such as Paris green one pound, fresh lime one pound, water 160 gallons. In apple or other orchards which are regularly sprayed with the poisoned Bordeaux mixture, little injury would be done by these and many other kinds of leaf-eating caterpillars.

ADDITIONAL INSECT GALLS OF ONTARIO.

By **Tennyson D. Jarvis**, Ontario Agricultural College, Guelph.

In last year's Annual Report,* I gave an account of a considerable number of Insect Galls found in Ontario. Further collections and investigations have enabled me to add the following to the list:—

Diptera.

The Iris Leaf Gall. (*Agromyza magnicornis*) (Lowe).

An oval enlargement on the inside of the leaf, usually about 1 in. from the tip. Length ½-¾ in., width ½ in., thickness, ⅓ in. Surface green, like that of the rest of the leaf, except that it is somewhat whitened and withered in appearance. The interior is composed of loose, parenchymatous tissues separated from one another by many air cavities. In the centre is a single chamber about ⅓ in. long and ¼ in. in diameter. Where the gall occurs the leaf broadens, but above the affected part it becomes distorted and dwarfed. Larva, white. Pupa, dark brown. Occurs on the Blue Flag (*Iris versicolor*). Common.

Aspen Egg Gall. (*Agromyza æneiventris*, Fallen). Plate A., fig. 8.

This gall resembles in external appearance the Egg Galls of the willow and Basswood, but sometimes it more nearly encircles the branch or twig. In form it is irregularly oval, about ⅓ to ½ in. long, ¼ to ⅓ in. wide and ⅛ to ⅓ in. high. The texture is pit-like. The surface, at first smooth and like that of the bark, grows rougher as the gall matures. Polythalamous. The larvæ are greenish, about 3 mm. long and 1 mm. thick. It occurs, usually, singly but often with two united in a straight line, on the terminal branches of the American Aspen (*Populus tremuloides*). Fairly common at Guelph.

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*Thirty-seventh Annual Report of the Entomological Society of Ontario, 1906, pages 56-72.

The Willow Potato Gall (*Rhabdophaga batatas*, O. S.) Plate A., fig. 7. An oblong ovate gall about 1 in. in length and ⅓ to ½ in. in thickness. The surface is irregular, but for the most part fairly smooth. The color is similar to that of the bark at first, but turns gray when mature. The texture is pith-like, but fairly hard. The gall is polythalamous. The larvæ are small and pinkish. It occurs singly usually, but sometimes with two or more in close proximity on any part of the twigs of the Scrub Willow (*Salix* sp.). .Common.

Cock's Comb Hawthorn Gall (*Hormomyia cratægifolia*, Felt). Plate A, fig. 4.

This gall is very similar to the Cock's Comb Gall on the Elm (*Colopha ulmicola*). It is on the upper surface of the leaf and has the appearance of two tiny leaflets about 4-6 mm. high and 8-10 mm. long growing up parallel to each other but at right angles to the surface of the leaf. The upper margin of each is crenate usually, but sometimes the two leaflets coalesce at the top and become thickened in this part. They are green in appearance and of the same texture as the rest of the leaf. On the under surface, there is usually a considerable depression or groove on each side of the base of the gall. Of the infested leaves examined, none had more than two galls to a leaf. Monothalamous; contains a single white larva tinged with yellow. Occurs on the Hawthorn (*Cratægus* sp.). Rather rare.

Elm Leaf-fold Gall. (*Cecidomyia ulmi*, Beuten.) Plate A, fig. 1.

The gall takes the form of a pulpy thickening of the tissues in the under-surface of the leaf, extending for some distance along the midrib. It is usually near the base of the leaf, and causes the upper surface to double on itself instead of expanding in the ordinary way. The enlargement varies in length from about ¼ to1 in. and usually extends about ¼ in. on each side of the midrib. It is about 2 mm. thick. The surface is pubescent like that of the rest of the leaf, but is more or less irregular, with ridges and hollows, often appearing as though two or three galls were joined together. On the upper surface of the leaf the pocket found opposite to the enlargement on the lower surface contains several small white larvæ which have a slight pinkish tinge. The gall occurs on the American Elm (*Ulmus Americana*). Fairly common this year, 1907.

Balsam Fir Needle-Gall. (*Cecidomyia balsamifera*, Lintner). Plate A, fig. 3.

This is an irregularly oblong gall, situated near the base of the needle on the new growth. It encircles the needle, is about 3 mm. long, and from 1 to 2 mm. thick. The surface in most cases is smooth, though often somewhat corrugated, especially on the under surface. The color is a little paler green than that of the needle and the texture somewhat looser and more pulpy. The gall is monothalamous and contains a single orange-colored larva which (August 5th, 1907) had not yet begun to pupate. There is usually only one gall to a needle, but sometimes two continuous ones are found. Occurs on the Balsam Fir, (*Abies balsamea*). Rare.

Dogwood Leaf Gall. (*Lasioptera corni*, Felt.). Plate A, fig. 2.

Thin-walled circular elevations on the under side of the leaves of Cornus. Somewhat bladder-like in appearance, and sometimes occurring in great numbers. A light-colored areola surrounds the gall which is monothalamous and contains a small larva which moves about quite actively when disturbed. Generally about .5 cm. in diameter. Not commonly distributed but, when found, occurring in great numbers. Late July and August. Found on Cornus sp. Common at Guelph.

Willow Joint Gall. (*Rhabdophaga nodulus*, Walsh). Plate A, fig. 9.

A rather small, irregularly, oval enlargement of the stem at the joints or nodes, about ⅓ to ½ in. in length and ¼ in. in diameter; the texture is woody; the surface smooth and like that of the bark; monothalamous. It occurs on the stem and branches of the Scrub Willow (Salix sp.). Fairly common at Guelph.

Hickory Cone Gall, (*Cecidomyia sanguinolenta*, O.S.).

This is a conical or sometimes almost spherical gall, situated on the under surface of the leaf along the veins. It is much constricted at the point of attachment with the leaf. Height about 4 mm., greatest diameter 3 to 4 mm., surface even, slightly pubescent, color at first red or purplish, later turning brown, monothalamous. The surrounding walls are nearly 1 mm. thick and of close, firm texture when mature. Numerous galls are usually found on a single affected leaf. They occur on the Sweet Hickory (*Carya alba*). Common in some localities.

Hickory Seed Gall, (*Cecidomyia caryæcola*, O. S.).

This is a conical gall with a fine, elongated tip. It is about 5 to 6 mm. in length and 2 to 3 mm. in greatest diameter, is smooth, pale green, turning brown in autumn, monothalamous; the enclosing walls are about .5 mm. thick, close and firm in texture when mature. It is found singly or in large numbers along the veins on the under side of the affected leaves of the Sweet Hickory, (*Carya alba*). Common in some localities.

Grape Vine Tomato-Gall, (*Lasioptera vitis*, O. S.).

"Consists of a bunch of irregular swellings of various rounded shapes. Soft, juicy and succulent. Yellowish green, tinged with red or entirely of this color. On stems and leaf stalks of Wild Grapes. May and June. Common." (Beutenmuller). I have not seen the gall myself, but it is reported from Ottawa by Dr. Fletcher, in the Report of the Entomologist and Botanist for 1887, page 29.

Bunch Gall on Willow. (*Rhabdophaga brassicoides*).

This is a gall of the same type as *Cecidomyia solidaginis*. It consists of a bunch of massed leaves which surround a small cell containing a yellowish larva. Growth having been checked at the end of the stem, this cluster of leaves has been formed. Occurs on Scrub Willow (Salix sp.). Not common.

Goldenrod Terminal Gall (*Asphondylia monacha*, O. S.).

This gall occurs at the tip of the plant and is a leafy conical structure ½ to 1½ in. high and ½ in. in diameter. It consists of many leaflets clustered together and having their basal parts thicker than the part above. This thickened part forms the broad base of the cone, and the thinner part immediately above being incurved completes the conical structure. Above this conical foundation the tip of the leaflets extends to a greater or less degree and forms a sort of rosette. Between the thickened parts of the leaflets live from one to many small yellowish white, or in some stages almost orange, larvæ. The gall occurs on the Goldenrod (*Solidago Canadensis*). Common.

Willow Bud-Gall, (*Rhabdophaga triticoides*, Walsh).

This gall seems to be an altered or transformed bud. The bud scales become elongated and the interior becomes a cavity in which the larva lives. The gall is about 5 mm. long, 2 mm. wide, and 1 mm. thick; the side against the stem is flattened. The color and surface are like those of the stem itself. Monothalamous. It occurs on the twigs of the Scrub Willow (*Salix* sp.) and usually causes the stem to bend at the infested point. Common in some localities near Guelph.

Lunate Marginal Gall. (*Choristoneura flavolunata*, Felt). Plate A, fig. 6.

Circular or somewhat irregularly elliptical spot-like galls only projecting very slightly from each side of the leaf. They are about 1-5—2-5 inch in diameter, the main part of the spot is light colored (usually yellowish), this being enclosed by a dark ring, thus giving it some resemblance to an eye. The galls are glabrous and monothalamous, the larvæ feeding on the internal tissue of the leaf without causing much projection from within. Usually not more than 1 to 2 spots on each leaf. Occurs on *Solidago Canadensis*. Common at Guelph.

Blackberry Leaf Gall, (*Cecidomyia farinosa*, O. S.).

Consists of woody swellings at the base of the leaflets or on the midrib of the blackberry. The larvæ are purplish in color. Rare at Guelph.

Boneset Stem Gall (*Choristoneura perfoliata*, Felt.) Plate A, fig. 5.

Consists of oval swellings of the stems and leaf stalks. When mature, the enlargement is about twice the normal size of the stem. The gall is monothalamous and contains red larvæ. Fairly common at Guelph.

Spiræa Pod Gall (*Cecidomyia salicifoliæ*, O. S.).

The Pod Gall of the Meadow Sweet is found not only on *Spiræa salicifolia* but also on *S. tomentosa* and *S. betulæfolia*. It is quite similar in shape and appearance on all three, and in each it is found on the under surface of the leaf as stated in Entomological Report of 1906, page 68.

Golden-rod Gall (*Trypeta polita*, Loew).

Consists of a bunch of dwarfed leaves caused by the arrest of the growth of the branches. It is a little more than half an inch in length. The larva lives at the base of the gall. Fairly common at Guelph. On Golden-rod (*Solidago Canadensis*).

HYMENOPTERA.

The Large Spiny Rose Gall (*Rhodites multispinosus*, Gill). Plate B, fig. 3.

This gall, when mature, is oblong or sometimes ovate in shape, and is found on the stem and the branches. It averages 1 to 2 in. in length and ¾ to 1 in. in thickness in the widest part. The surface is covered with numerous spines or prickles about ¼ in. long and is light brown colored. The surface of the gall itself is somewhat rough and irregular, with depressions and elevations sometimes of considerable size. Moreover, after the gall-insects have emerged it is perforated with from 30 to 50 small, circular apertures, each about 1.5 mm. in diameter. The color of the gall is a dull gray. Its texture is firm, hard, brown colored, and granular. The gall is polythalamous, containing from 30 to 50 chambers, each about 3 to 5 mm. long and 2 mm. wide and arranged more or less radially, along the longitudinal axis. When mature, the gall-insects make a tunnel from these to the surface. The adult insect is a Cynipid about ¼ inch long with reddish colored head, thorax and abdomen. The gall occurs on the Wild Rose. Rare; Niagara District and Toronto.

Cinquefoil Axil Gall (*Diastrophus potentillæ*, Bass). Plate B, fig. 5.

The gall is spherical or oval in shape, from ¼ to ½ inch in diameter and about ½ inch long, and is borne on a slightly curved peduncle 3-5 to ½ inch long arising in the axil of the leaves. The gall is spongy in texture, with a solitary central chamber containing the white curved larva which is about 3 mm. in length. The gall is green in summer, reddish brown in winter. Occurs on *Potentilla Canadensis*. Rare in Eastern Ontario.

Blackberry Seed Gall (*Diastrophus cuscutæformis*, O. S.).

Consists of hard, woody, somewhat globular seed-like bodies 2 to 4 mm. in diameter. More or less covered with curved spines which are about 2 mm. long. Yellowish green or olive in color and borne in clusters on the stem, each gall containing one chamber. Rare at Guelph. Occurs on Blackberry (*Rubus villosus*).

Raspberry Stem Gall. (*Diastrophus turgidus*, Bass). Plate B, fig. 2.

A large reddish-brown polythalamous, tubercular or irregular gall, about 1 to 1.75 in. long and .5 in. in average diameter, arising abruptly on the stem. Green in summer, darkening towards winter. Chambers are very numerous, oval in shape, 1.5 to 2 in. in width and 2.3 in. deep. The gall has a number of prickles scattered over it which are about 2 to 3 mm. long, and appear to be enlarged stem prickles.

Oval Willow Stem Gall (*Euura S. nodus*, Walsh).

"A mere general enlargement of a twig from one-quarter more than its normal diameter up to twice its normal diameter, almost always without any abnormal roughness on the external bark, and not always confined to one side only of the twig. General color that of the twig. When cut into (August 28th), the interior of each gall is found to be pithy and to contain 1 to 3 larvæ in separate cells. Frequently on a piece of twig 6 in. long, 2, 3, or 4 of these galls are placed at irregular intervals. No appearance internally of any transverse plates or transverse fibres as in *S. ovum* and *S. ovulum*. Length .75 to 1.50 in., diameter .10 to .25 in. Very like the Cecidomyidous gall, *S. nodulus*, on the same willow (Proc. Am. Ent. Soc., Philada., III, p. 600) but is much larger, is polythalamous instead of monothalamous" (Walsh). The specimens found at Guelph were from .50 to .75 in. in length. The adults of any specimens examined on May 30 had emerged. Occurs on the Scrub Willow (*Salix sp.*). Common in some localities.

Rose Leaf Nipple Gall, (*Rhodites lenticularis*, Bass).

This is a small circular gall of about 3 mm. in diameter. The upper surface is practically on a level with the surface of the leaf and is pale green in color. It is characterized, however, by the presence of a little nipple in the centre, the nipple often being of a purplish shade. The under surface is slightly raised beyond the rest of the leaf and, unlike the upper, is purplish in color and has a slight depression in the centre corresponding to the nipple above. The galls occur singly or, more commonly, in groups, often covering the whole leaf and making its surface uneven. Found on the Rosebush (*Rosa* sp.). Rare.

Oak Wart Gall (*Andricus futilis*, O. S.). Plate B, fig. 4.

This is a rather small, wart-like gall situated in the parenchyma of the leaf and protruding beyond both surfaces, but chiefly beyond the lower. The protuberance on the lower surface is roughly hemispherical in form, averaging 4 mm. in diameter and 2 mm. in height. Its surface is often smooth and even, but quite often it is uneven or pebbly. The color is considerably lighter than the rest of the under surface of the leaf. The protuberance on the upper surface is much the same shape and nature, but is not so high as a rule, being usually only about 1 mm. in height. Its color is also lighter than the color of the surrounding part of the leaf, but darker than that of the under side of the gall. The walls of the gall are thin and much the same texture as the parenchyma of the leaf. The interior contains a kernel composed of two small oblong cells joined together along the side parallel to their longitudinal axis. Each cell has a small cavity within it containing a single, small, white larva. The adult insects emerged about July 30, 1907, and were small, reddish Cynipids. One to several galls may occur on a leaf. They are found either on Burr or White Oak. (*Quercus macrocarpa* and *Quercus alba*). Common.

Burr Oak Leafy-wreath Gall (*Andricus topiarius*, Ashm). Plate C, fig. 6.

This gall resembles in external appearance the Goldenrod Bunch Gall (*Cecidomyia solidaginis*). It consists of a cluster of dense, narrow leaflets springing from a bud. When mature several small, brownish pupal cases about 3 mm. long and 2 mm. wide can be seen among the leaflets, attached at the base to the woody tissues below. The larvæ are minute and whitish. It occurs on the terminal twigs of the Burr Oak (*Quercus macrocarpa*). Common.

Oak Knot Gall (*Andricus punctatus*, Bass). Plate C, fig. 1.

This is a rough, hard, woody, somewhat globular, knot-like gall encircling the stem and varying greatly in size, but commonly 1 to 2 inches in diameter. The surface is ashy brown in color, and rough, with almost a network of little ridges and depressions. Polythalamous. It occurs on the branches of the Scarlet Oak (*Quercus coccinea*). Common.

Oak Seed-Gall (*Andricus seminator*, Harr.).

This is a woolly gall encircling the stem. It is irregularly oval, ½ to 1½ in. in diameter and ¾ to 2 in. in length. Polythalamous, containing many cream-colored cases attached to the twig, each case looking very like an oat seed. Early in the season the gall is white, but later it becomes brown. Occurs on the twigs of the White Oak (*Quercus alba*), Puslinch Lake. Rare.

Pine-cone Oak Gall (*Cynips strobilana*, O. S.). Plate C, fig. 4.

This gall is formed in the axil of a lateral bud just at the base of the terminal bud-cluster. When viewed from some little distance, it appears like a solid globular structure about ½ in. in diameter, but when more closely examined it is found to consist of a rosette, or head of hard, brown, nut-like, wedge-shaped structures fitting closely to one another and attached at the base to a small spherical receptacle about ¼ to ⅓ in. in diameter. Inside of each of these nutlets there is a single chamber, containing but one white larva. Occurs on the terminal twigs of the Burr Oak (*Quercus macrocarpa*). Common at Guelph.

Oak Fig Gall (*Biorhiza forticornis*, Walsh). Plate C, fig. 2.

A group of many small, soft, bladder-like, one-celled structures, each about 1-3 in. in diameter. These are often compared to a bunch or cluster of pressed figs, but seem to me to resemble more nearly the honeycomb of the bumble-bee, except that they are pale yellow in color, sometimes tinged with red, turning yellowish brown in autumn. They are arranged in a cylindrical cluster along the stem of the branches or twigs. The cluster is 1 to 2 in. long and ½ to ¾ in. in diameter. The interior of each one of these bladder-like bodies is loosely filled with woolly fibres which keep in its position the small larval cell. Occurs on the twigs of the White Oak (*Quercus alba*). Common in some localities.

Empty Oak Apple (*Amphibolips inanis*, O. S.).

This oak apple gall is very similar in external appearance to *Amphibolips confluentus* (Harr.) but is considerably smaller and is quite dissimilar in its internal structure. It is found on the under side of the leaf, and springs from one of the main veins, is nearly spherical in form, about ½—5-6 in. in diameter, and has a smooth, glossy, light brown surface when mature, which earlier in the season is green. The walls which enclose the almost empty interior are very thin, somewhat parchment-like and brittle. The small spherical larval cell within the cavity is about ¼ in. in diameter and is held in position by a comparatively small number of filaments which radiate from it to the surrounding walls. It occurs on the Red Oak (*Quercus rubra*). Rare.

White Oak Club Gall (*Andricus clavula*, Bass). Plate C, fig. 3.

This is a club-shaped gall situated at the tip of the twigs. It evidently originates in the terminal bud-clusters, which it prevents from developing, though occasionally a few leaves grow out from the gall itself. When mature, it is ½ to 1 in. long, hard and woody in texture, a little darker in color than the rest of the bark, and somewhat grooved and ridged. Very often a second, or even a third, somewhat smaller gall is formed from the lateral buds immediately below. The terminal gall, in the cases examined, was dithalamous, the lateral ones monothalamous. It occurs on the White Oak (*Quercus alba*). Common in Muskoka.

Willow Petiole and Leaf-base Gall (Saw-fly)—*Pontania desmodioides* (Walsh).

This gall has the form of an oblong enlargement of the petiole, or often of the midrib of the leaf near the base. It is 8 to 15 mm. long and 4 to 6 mm. in diameter. Surface smooth and glossy, like that of the leaf; occasionally, however, it is somewhat rugose and irregular. The gall is solid and of a pulpy texture. It was monothalamous on July 8th, the date of discovery, the cavity being very small and containing a tiny greenish-white transparent larva with a brown head. Occurs on the Willow (*Salix lucida*). Rare, at Guelph.

Red Oak Gall (*Andricus papillatus*). Plate C, fig.5.

This gall is red and projects on both sides of the leaf. It is round and about 4 mm. in diameter. Above dark red, below yellowish. About three times the thickness of the leaf. On Red Oak at Puslinch Lake. July.

Spiny Ball Gall on Wild Rose leaf.

The gall described as *Rhodites bicolor* (37th Annual Report, page 70, Plate E, fig. 2), has been identified by Mr. Wm. Beutenmuller as *R. nebulosus*.

LEPIDOPTERA.

Golden Oval Stem Gall (*Eucosma Scudderiana*, Clem.). Plate C, fig. 7.

This gall is situated on the stem and is oval in form, about 1 cm. long and 4 to 5 mm. in diameter. Its surface is similar to that of the stem, but the color is a little darker around the central part. It is pithy in texture and monothalamous. At the date of writing, July 24th, the chamber was small and cylindrical, and contained a single orange-colored larva. The galls are found either singly or often with two united and forming an irregular elongated enlargement. They occur on the Goldenrod (*Solidago* sp.). Common in Muskoka.

HEMIPTERA.

Plum Gall on Elm (*Pemphigus ulmi-fuscus*). Plate C, fig. 8.

This attractive looking gall occurs on the upper surface of the leaf and resembles in shape an unripe cherry or plum, there being an upper glossy green drupe-like part and a short stem connecting this with the leaf. The drupe-like part is slightly oblong in most cases and varies in length from 8 to 10 mm. and in thickness from 5 to 7 mm. The stem is from 3 to 4 mm. long and 2 to 3 mm. thick. The gall is monothalamous; a rather thin outer covering about 1 mm. thick and somewhat firmer in texture than the leaf encloses a large, round cavity, in which a single mother insect brings forth her brood of many young. The part of the leaf from which the gall springs is drained of its nourishment and becomes whitish and roughened or blistered on both sides. Occurs singly on the leaf of the English Elm (*Ulmus campestris*). Rare.

NOTE.—There is a very similar gall on the Red Elm, but differing in the following respects: (1) It is twice as large; (2) Its texture is a little thicker; (3) The surface is rough, like the leaf, not glossy; (4) The part of the leaf around the base is quite normal in appearance, showing no signs of being weakened through lack of nourishment or any other cause. Probably the difference in the vigor of the two kinds of trees and in the character of leaf will account for these differences in the galls.

Hickory Hemispherical Gall (*Dactylosphæra hemisphericum*).

This gall is nearly hemispherical in shape, is formed in the parenchyma of the leaf, and the main part of it projects above the upper surface. It varies in size, being from 4 to 10 mm. in diameter and 3 to 5 mm. in height. The color is usually pale green, often changing to a reddish shade on most of the upper surface of the gall. After maturity the gall withers and becomes dark brown and dead looking, thus greatly disfiguring the leaf. The upper surface of the gall, before it has begun to wither, is slightly roughened by a few depressions and elevations. The under surface is of a paler color, being greenish-white. It does not project beyond the surface except at the small aperture, which is a slit about ⅓ of the total diameter in length. Both sides of this slit project a little beyond the rest of the base of the gall and are reflexed so as to form a mouth-like structure. The gall is monothalamous. The walls are nearly 1 mm. thick and are somewhat hard and tough in texture. There may be only one or many galls on a single leaf. In most cases where they are abundant they seem to arrange themselves in rows along the midrib, often two deep on each side. Occurs on Shell-bark Hickory (*Carya alba*). Common.

ERIOPHYIDÆ.

Buttonwood Gall (*Eriophyes cephalanthi*).

This gall usually has the form of a number of small protuberances from 1 to 3 mm. high, which have coalesced at the base into one irregularly shaped cluster. The size and extent of a cluster varies greatly; sometimes a very small part of the leaf, less than one-eighth in some cases, is affected; at other times several large clusters are found on the same leaf, and occasionally the whole leaf is covered with galls. The galls are usually of a little paler shade of green than the rest of the leaf, but the top is often reddish in color. The texture is somewhat thicker and firmer than that of the leaf. The under surface of the leaf at the affected part is usually depressed, is rough and covered with a white pubescence. The gall occurs on the Buttonweed (*Cephalanthus occidentalis*). Common in Muskoka.

Ball Gall of the June berry (*Eriophyes* sp.). Plate D, fig. 1.

This is a small, nearly globular gall averaging about 2 mm. in diameter. It is found either singly or in clusters on any part of the upper surface of the leaf. On the lower surface the presence of the gall is indicated by a very small protuberance which is covered with a hoary pubescence. The main part of the gall, as seen on the upper surface, is dark brown in color, has a slightly roughened surface and is covered with a similar pubescence to the part on the lower surface. It is monothalamous. The walls of the chamber are thin (about 2 mm. in thickness), firm, and somewhat leathery in texture. The chamber is spherical. The gall is rather broadly attached to the leaf, the constricted part being about ⅔ of the total diameter of the gall. It occurs on the June berry (*Amelanchier rotundifolia*). Rare.

The Unsightly Willow Gall, (*Eriophyes* sp.) Plate D, fig. 5.

This far-from-beautiful gall seems in most cases to spring from the axils of the leaves; occasionally, however, it is formed on the leaf itself. Often several galls are formed near the end of a twig. In these cases probably they started in the axils of the leaves which were subsequently absorbed into the galls themselves. Where the galls occur near the terminus of a twig, they are usually thickly clustered and encircle the stem, whose longitudinal growth becomes checked in such cases. The galls vary greatly in size and compactness of structure. Occasionally one is found that has the appearance of a small rosette, about ½ to 1 inch in diameter, composed of tiny, thickened leaflets covered with a whitish pubescence, the basal half of the leaflets being grown together and only the upper half being separate. In other cases a number of smaller galls are loosely clustered into one fairly large group, often an inch or more long.. In other cases only a single diminutive gall is found. The galls, especially where loosely clustered, look considerably like the flower or fruit clusters of Lamb's Quarter (*Chenopodium album*), or like a very irregular whitish green fungus growth. In fall and winter they become grayish black and, where numerous, disfigure the tree considerably. They occur on the Scrub Willow (*Salix* sp.). Rare, except in a few localities.

Chestnut Leaf Gall (*Eriophyes*, sp.).

A small gall projecting from both sides of the leaf. When found along the side of the leaf-vein it is hemispherical, elsewhere is more or less spherical. The diameter is about 2 to 3 mm. Somewhat the larger half of the gall is on the upper surface. The color at first is green, but turns brown when mature. Monothalamous. Occurs on the Chestnut (*Castanea sativa*). Common.

Convex Gall of Poplar (*Eriophyes sp.*). Plate D, fig. 3.

This gall has the shape that one imagines would be formed if he were to press the tip of the little finger, or of some round instrument, against the lower surface of the leaf and, without breaking the tissues, were to cause them to yield until there was a decided depression on the lower surface and a corresponding bulge on the upper. There is practically no thickening of the tissues of the leaf or change in color except that the under surface of the gall is orange yellow. The depression varies in size, being about 4-12 mm. in diameter and 2-5 mm. in depth. Occurs on Lombardy Poplar (*Populus dilatata*). Rare.

Walnut-leaf Wart Gall (*Eriophyes sp.*).

A warty protuberance chiefly on the upper surface of the leaf, constricted at the base, about 2-5 mm. high and 2-3 mm. thick in its widest part; surface usually very uneven with many depressions and elevations; color green; texture of outer part somewhat pulpy but most of the interior is composed of a mass of loosely woven silvery fibres or strands. This gall resembles greatly the Elm-leaf Wart Gall (*Eriophyes ulmi*), but has a rougher surface at the top and is not frequently found on the under surface of the leaf. Occurs on black walnut (*Juglans nigra*). Common.

Walnut-Cushion Gall (*Eriophyes sp.*). Plate D, fig. 2.

Large and somewhat cylindrical in outline. Found on the lower portion of the petiole (in some cases the pulvillus is affected). A green solid swelling clothed by a dense fur-like covering of short reddish hairs about 1 mm. in length. The galls usually appear on the upper side of the petiole, with the edges overlapping. 8-10 mm. long and 4-8 mm. broad, but varying considerably in size. On black walnut (*Juglans nigra*).

Unsightly Poplar Stem-gall (*Eriophyes sp.*).

This is one of the most irregular and unsightly of all our galls. It is found on the stem of young twigs though sometimes it extends to the basal part of an adjoining leaf or leaves. It seems always to start in the axil of a leaf. The stem gradually thickens at the affected part to almost three times its normal size and does not continue to elongate in this part as it does above and below it; so that in a space of 1 to 2 inches where we should normally find not more than four leaves, we here get eight or nine, some of them dwarfed and distorted. Moreover the stem at this point, instead of growing straight out in its normal direction, often becomes distorted and bent in another direction, sometimes nearly at right angles to its former course, and then coming back to its first direction grows on parallel to it. The gall itself looks like a very irregular tubercular mass of closely packed small reddish-green protuberances about ¼ inch high. These irregular masses in some places encircle the stem, in others are chiefly on one side of it though often extending to the basal part of the leaves. Sometimes the masses are so close as to be continuous, at other times they are ¼ inch or more apart. The whole of the affected part of the stem is usually from ½ to 1¼ inches in length, and the irregular mass when surrounding the twig makes the total diameter ½ to 1 inch. Later in the season and during the winter the gall is black and the part of the stem above it in most cases dies. There is usually but one gall on a stem, but sometimes a second or third occurs at some distance below it. This gall is somewhat similar to what I have called the unsightly Willow Gall, described above. It occurs on the American Aspen (*Populus tremuloides*). Rather rare.

Speck Gall of Chokeberry (*Eriophyes sp.*)

This gall, as the name indicates, is a very tiny, speck-like structure, usually much smaller than the head of a pin but occasionally a little larger. It is visible equally on both sides of the leaf and, when mature, is of a brown color. In none of the numerous specimens observed did it extend more than .5 mm. beyond the surface. The gall resembles very much a species of Eriophyes gall found on the hawthorn. Numerous galls, scattered here and there throughout the parenchyma, are usually found on each infested leaf. They occur on the chokeberry. (*Pyrus melanocarpa*). Common in Muskoka.

Grape Leaf Wart Gall (*Eriophyes sp.*).

This is a small semi-circular, or sometimes nearly circular, wart-like gall situated along the veins of the leaves. It is about 2 mm. in diameter and only very slightly elevated beyond the plane of either surface of the leaf. The upper surface is fairly smooth and slightly paler in color than the rest of the leaf. The under-surface is of much the same color and kind of surface as the underside of the leaf, but it has a tiny white nipple in the centre, and around all the gall, except the part touching the vein, there is a distinct depression or furrow. There are often several galls on a single leaf. They occur on the Wild Grape (*Vitis cordifolia*).

Pin Cherry Gall (*Eriophyes sp.*).

Oblong or club-shaped, reddish projections scattered over the leaves, somewhat irregular in outline and pubescent, 3-4 mm. long .5-1 mm. diameter, being broadest at the top. Generally borne on a little curved peduncle-like portion which is about 1 mm. long and lighter in color.

In conclusion the writer desires to express his thanks to Dr. E. Porter Felt, Mr. William Beutenmuller, and Prof. Bethune who have most kindly aided in the preparation of this paper. Especial recognition must be given to Mr. L. Cæsar, who has assisted in describing many of the species. I am much indebted to Mr. W. R. Thompson and Mr. C. D. Jarvis, who have furnished the photographs for this paper.

INJURIOUS INSECTS IN ONTARIO IN 1907.

By C. J. S. Bethune, Ontario Agricultural College, Guelph.

Owing to the prolonged cold weather during April and May the season of 1907 was remarkably backward and the appearance of our common insect pests was much later than usual. Many kinds were no doubt greatly reduced in numbers by the change from very warm days during the last week in March, which caused them to come out of their winter quarters, to the abnormal cold of the following two months. A drop of 50 degrees of temperature between the 29th of March and the 1st of April must have been a severe trial of the vitality of the early appearing species and large numbers must have succumbed to it. But notwithstanding these losses, most of our familiar insects were to be found during the season, while some were conspicuous by their absence. Among the latter may be mentioned the Squash-bug (*Anasa tristis*), which has entirely disappeared in this part of the province, though one of our most abundant pests only a few years ago. The season was marked by one great outbreak of the Variegated Cut-worm, a full account of which is given in another part of this report.

Fruit-Tree Insects.

Among insects affecting fruit, none has been more complained of this year than the codling-moth, which has taken its heavy toll from orchards throughout the fruit-growing districts. The greatest amount of damage has been inflicted in those localities where there is a second brood of the worms. Careful spraying twice in the spring with poisoned Bordeaux mixture followed by the prompt removal of all fallen fruit, should reduce the second brood to a minimum, and what survives may be successfully dealt with by bandaging the trees from the middle of July, and destroying regularly the worms that take refuge under them. These operations certainly involve much trouble and expense, but it has been many times proved that they pay well in clean marketable fruit and plenty of it. There are still some points in the life history of the codling-moth about which we continue in doubt and many careful observations in different localities are required to clear them up. Recent discussions among our most practical fruit growers show that interest in these matters has been awakened, many various opinions have been expressed and painstaking investigations may be expected. Any positive results will, no doubt, be made known at once.

Another insect that threatens to spread over the province is the Apple Maggot (*Rhagoletis pomonella*), which is quite as injurious to the fruit as the codling-worm. In the central part of the State of New York, in Connecticut and Vermont, and as far north-east as Maine, this is now a most serious pest. In many localities it is impossible to find an apple free from the attack, which spoils the appearance of the fruit and renders it worthless. So far we have only seen specimens in this country from the neighborhood of Bowmanville, and Dr. Fletcher last year recorded its presence in injurious numbers in the county of Prince Edward. Having now obtained a foothold, it is to be feared that its range will soon be extended over a wide area and that fruit-growers will have another just cause for lamentation. The damage is caused by a small white slender maggot, which burrows in all directions through the fruit, turning the flesh brown wherever it goes; it takes about six weeks to mature and then it usually causes the fruit to fall, in which case it leaves the apple and enters the ground. The parent is a small, two-winged fly, prettily marked with bands and with golden eyes. The female punctures the fruit with her ovipositor and inserts the egg beneath the skin, consequently spraying with any poisonous mixture is of no avail. The emergence of the parent flies and their egg-laying is very irregular and may take place at any time during the summer and even when the fruit is fully formed. When this is the case apples apparently sound when picked may later on become worthless from the working of the unsuspected maggot within. Thus it may be seen that this is a very serious pest and most difficult to deal with. The only remedy so far known is to destroy all fallen fruit without delay; this should be done daily in order to give no time for the maggots to escape into the ground. The cheapest and most effective plan is to let growing pigs have the run of the orchard: they will keep the ground clear of fallen fruit and will thus devour both these maggots and the codling-worm as well.

Scale Insects. An unusually large number of enquiries have been made this year respecting scale insects and a number of different kinds have been received for identification. This does not necessarily mean that these insects have been more abundant than in previous years, but rather that fruit-growers have paid more attention to them and are realizing what dangerous enemies many of them are. The Oyster-shell Bark-louse (*Lepidosaphes ulmi*) was the species most commonly sent in; its range extends all over the province and its injuries are so apparent that they cannot escape the notice of the most careless owners of orchards. Twigs completely encrusted with the scales were received from many correspondents, showing the severity of the attack and the failure to employ any remedy. Not only do these scale insects drain out the life of the tree through the beaks of innumerable hosts, but they at the same time so weaken the vitality of the twig or branch, and eventually the whole tree, that it readily becomes a prey to canker and fungus diseases and the onslaughts of borers which only affect the sickly and the dying. Happily the remedy is simple, cheap and easy of application—lime-wash (one pound and a half of quickly slaked lime to a gallon of water) should be applied to the trees after the leaves fall in the autumn. The spraying must be thoroughly done from the highest twig to the base of the trunk so that every portion will show up white,

A second application a week or two later or before the buds open in the spring will complete the job and clear the tree. As a matter of precaution it will be well to repeat the operation during the following year. We have found many scales destroyed by a minute parasitic insect, and in some instances a fungus growth has killed the whole colony.

The San José scale is gradually spreading from its original centres of infestation in the Niagara district and Kent and Essex counties. In the former it is extending its range westward along the lake shore country towards Hamilton, and in the latter it has been found as far east as Aylmer in the county of Elgin. This spread of the insect is entirely due to the carelessness, indifference or ignorance—and perhaps indolence—of a large number of owners of fruit-trees who will not take the trouble to cut down and burn dying trees or to spray all those that are in any degree infested. The lime-sulphur wash is a complete remedy, but it must be properly made and thoroughly applied. If universally employed wherever the San José scale is to be found, it would not take many years to entirely get rid of the pest.

Several other scale insects have attracted attention, but none of them have become serious pests. There is always, however, a danger that some one or more of them may develop, if neglected, into a menace to the fruit-trees they attack. The Scurfy, Terrapin, Putnam and Forbes scales are those which have been chiefly noticed. The lime-sulphur wash, followed by kerosene emulsion when the lice are moving in early summer, will keep these scales in check. Their presence should be looked for on Hawthorns, Mountain-ash and other trees as well as those grown in the orchard or garden.

Among other insects affecting fruit-trees that were noticeable during the past season may be mentioned the Shot-hole borer or Fruit-tree Bark-beetle (*Scolytus rugulosus*), which was somewhat abundant in the Niagara district. It especially attacked cherry-trees, on which its presence was make known by exudations of gum. This small beetle does not as a rule affect healthy trees but only those that are sickly and dying, and is often found on limbs whose vitality has been weakened by scale insects. The only available remedy is to cut off and burn all limbs that have been attacked; dying trees should be removed and all brushwood from prunings burnt.

The usual perennial insects, that are more or less abundant every year, made their presence felt this year also, such as the plum curculio, the eye-spotted bud-moth, pear-tree slug, tree cricket, rose chafer and the grape-vine flea-beetle. Fuller information regarding these insects and how to deal with them may be found in a recent bulletin by the writer on "Insects affecting Fruit-trees" issued by the Ontario Department of Agriculture.

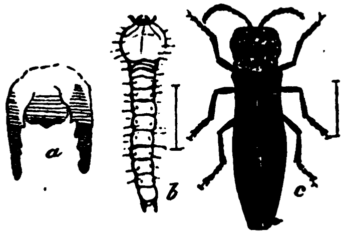

Fig. 30. Red-necked Agrillus; *a* anal processes; *b* larva; *c* beetle—much enlarged.

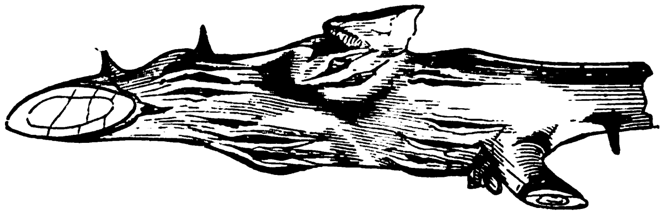

Fig. 31. Raspberry Gouty-gall caused by the Red-necked Agrilus.

Market gardeners in the neighborhood of London complained very much of an attack upon their raspberry bushes, which proved to have been made by a small beetle, the Red-necked Agrilus (*A ruficollis*). Fig. 30*c*. Portions of the canes were found to be much swollen in the form of a roughened pithy gall which rendered them liable to break off, or to dry up and die. Fig. 31. The beetle, which is about two-fifths of an inch in length, is slender in shape with a dark bronzy head, a bright coppery thorax and dark brownish wing covers. It lays its eggs on the canes in July and the grubs, which soon hatch out, burrow into the wood and by the irritation they produce in the plant-tissue cause the enlargement referred to, which is called the Raspberry Gouty-gall. The grubs are slender and thread-like, with a flat head, Fig. 30*b*, and live in the canes till the following spring, when they change to the chrysalis stage and later on appear as beetles. Cutting out and burning all affected canes is the only available remedy.

INSECTS OF THE FIELD AND GARDEN.

With the exception of the outbreak of the Variegated Cutworm, elsewhere referred to, which bored holes in green tomatoes and destroyed many kinds of vegetables and flowers, there is little to report this year concerning garden insects. The tarnished and four-lined bugs, the asparagus beetles, the cucumber beetles and the turnip and onion maggots, described in last year's report, were to be found almost everywhere, but in greatly reduced numbers on the whole. Apart from Cutworms, there were few complaints from correspondents respecting our usual enemies.

Numerous requests were made for remedies against wire-worms and white-grubs. Unfortunately there is no practicable method of dealing with these underground root-feeders by poisons of any kind. The only remedy is a system of rotation of crops, by which the pastures are broken up and land is not left for a number of years in sod. Deep ploughing in the autumn brings the grubs to the surface and breaks up the pupal cells in which they are transforming to beetles; by this means the exposure to the weather and to the attacks of their natural enemies, such as birds, etc., will get rid of large numbers of them.

Owing to the unusually dry summer grasshoppers throve and multiplied to such an extent that they became a veritable plague in some localities, and inflicted a large amount of damage to oat crops, grass lands, etc. The breaking up of their breeding places by ploughing up old dry pastures and stubble fields where they have laid their eggs is a useful method for the reduction of next year's brood. When the insects are abundant in August, much may be done to get rid of them by using what is called the "Criddle mixture." This is made by taking half a barrel of fresh horse manure and mixing with it two pounds of salt dissolved in half a pail of water and one pound of Paris green. The whole should be well stirred up and then scattered by means of a trowel or piece of shingle wherever the grasshoppers are to be seen, the insects will devour this in preference to any other kind of food and be poisoned in large numbers.

Plant-lice (*Aphis*) of various kinds were excessively abundant this year, especially during the latter part of the summer and early autumn, the dry season having been favorable for their multiplication. The most serious attacks were made upon turnips and cabbages during the month of September, when complaints and enquiries came in from many parts of the province. The standard remedies for these minute insects are the contact poisons, viz., kerosene emulsion, whale-oil soap and tobacco washes. After the crop has been removed the loose leaves and stalks of the cabbages and the tops of the turnips should be taken away and the ground ploughed up; this is done to destroy the eggs, which are laid on stalks and foliage before winter sets in.

Some alarm was caused in various quarters by the newspaper reports of "the Green Bug," which was said to be inflicting enormous damage upon the wheat and oat crops in the southern and middle western States. By this name was meant a green plant-louse (*Aphis*), which is sometimes troublesome to us in Ontario. As a general rule, however, it is kept in check by its natural enemies, the lady-bird beetles and other predaceous and parasitic insects. Occasionally these are insufficient to control the pest and it becomes so abundant that it causes a vast amount of damage to the crops. This seems to have been the case in the regions referred to.

The oat crop this year was affected by a serious blight which was manifested by the leaves turning yellow and withering away. Many farmers thought that this was caused by "the Green Bug" and sent in specimens for examination. A few were found to be infested with a plant-louse (*Aphis*), which sucks out the sap of the plant and greatly reduces its vitality; in these cases the blight might be caused by the insects' attack. But in the majority of examples which we have received and examined there was no trace of any injury by insects nor of any fungus disease. Specimens examined at the Bacteriological laboratory were also found to be free from any disease of a bacterial character. The conclusion was therefore arrived at that the blight was due almost entirely to atmospheric conditions, namely, late frosts in some localities, and in others cold, almost frosty, nights succeeded by bright, sunny days. The very late season evidently contributed to the injury, as the crop generally did not possess the vigor and vitality which would enable it to withstand the effects of occasional unfavorable weather.

REMARKABLE OUTBREAK OF THE VARIEGATED CUTWORM.

By C. J. S. Bethune, Ontario Agricultural College, Guelph.

On the evening of the 25th of July, a telephone message from Leamington was received at the Ontario Agricultural College urgently asking for help against a worm that was devouring everything before it. As no information was supplied that gave any clue to the identity of the depredator, an arrangement was at once made by the Department of Entomology to send to Leamington Mr. Cæsar, a fourth year student, and Mr. McMeans who is in charge of the vegetable gardens. They left the next morning and on the following evening Mr. McMeans brought me back specimens, which proved to be the Variegated Cutworm (*Peridroma saucia*), and gave me an account of the ravages of the insect and the advice that was given to the farmers whose crops were being attacked. Mr. Cæsar, who remained longer, subsequently gave me the more detailed report which is appended hereto. The outbreak is very remarkable, as nothing similar has been recorded since the year 1900, when these cutworms appeared in enormous numbers in British Columbia and the neighboring Pacific Coast States and were unusually abundant in

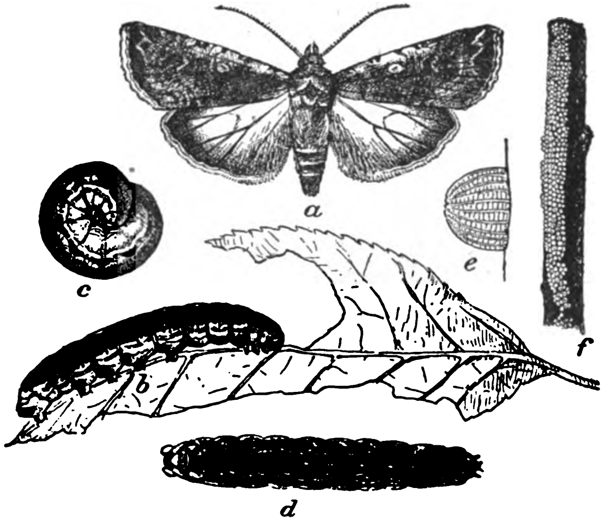

Fig. 32. *Peridroma Saucia*; *a*, moth; *b*, normal form of larva, lateral view; *c*, same in curved position; *d*, dark form, dorsal view; *e*, egg from side; *f*, egg mass on twig (after Howard, Division of Entomology, U. S. Dept. Agriculture).

Manitoba, Ontario, and many of the States to the south-west of us. Dr. Fletcher, in his annual report for 1900 (pages 215 to 227), gives a very full account of the insect and its ravages in British Columbia during that year.

Near Leamington the worms were first observed in clover fields, where they soon devoured the crop and left the ground bare and black; they then marched on to the next field and consumed whatever vegetation they met with; corn and tobacco, tomatoes and other vegetables seemed especial favorites for consumption. If a fruit tree happened to be in their way, they climbed it and devoured both fruit and foliage; many peach trees were thus attacked and the fruit ruined.

Like other cutworms these caterpillars feed only at night and remain in concealment during the day, hiding in the ground where the soil is loose, and under any rubbish or other shelter that they can find. When full-grown the worm is about two inches long, with a yellowish stripe on each side above the legs, the rest of the body is darker and mottled with black, white or grey; the most characteristic feature is a row of yellow or white spots, five to seven in number, along the middle line of the back. Fig. 32. Some of the worms changed into the chrysalis stage early in August, others later; for this purpose they buried themselves in the ground and formed there an oval earthen cell. The moth, into which they finally turned, has a wing expansion of about an inch, and is dark blackish brown in color, often clouded with red towards the front margin of the wings, but with no conspicuous or distinguishing markings; the underwings are white with a pearly lustre. Like so many other of our most destructive insects, this one has come to us from Europe.

REPORT BY MR. L. CÆSAR TO C. J. S. BETHUNE, PROFESSOR OF ENTOMOLOGY.

SIR,—I have the honor to submit the following report of my trip to Leamington, July 26th to 29th, to aid the farmers in their struggle against an insect pest that seemed to be devouring everything before it.

I arrived at Leamington about sunset, July 26th, and at once set out for the farm of W. T. Moore, who was the first to propose sending to your department for aid. By the assistance of a lantern we were able to see the caterpillars at work on Mr. Moore's tobacco and tomatoes. They proved to be the Variegated Cutworm (*Peridroma saucia*) and were very numerous, Mr. Moore on one occasion counted as many as 250 on a single plant. They had begun their ravages in a small plot of second growth clover which he was keeping for seed. To check them Mr. Moore at once plowed this down and rolled it, thereby no doubt destroying countless numbers; but many still remained. Finally, in his efforts to keep them from destroying his tobacco and tomatoes he had hit upon the device of plowing a furrow ahead of them. This, in a very sandy soil like his, gave excellent results and impeded the progress of the caterpillars better than one would have thought possible, especially as they climb corn stalks and trees without difficulty. The fine grains of sand, however, yielding as they tried to climb, made an insuperable barrier in most cases. I recommended Mr. Moore to make holes with steep edges and about one foot deep at intervals of about every twenty feet in the furrows. Next morning I had a chance to see the work of the furrow and holes combined on an adjoining farm. The result was most gratifying to all of us. In every hole there was a mass of caterpillars an inch or more deep. The farmer went from hole to hole with a piece of fence rail about five feet long and pounded his foes in each hole to death, evidently taking much pleasure in the operation.

Though I saw that very few caterpillars had been able to escape from the furrow and holes, yet as an extra precaution I advised that the uninjured plants immediately in front be sprayed with a strong mixture of Paris green and water, or that poisoned bran be scattered among them. Mr. McMeans of the Horticultural department, who was with me, suggested shorts as an alternative for bran.

After arranging to come back in the afternoon and superintend the preparation of the poisoned bran or shorts, I was driven by Mr. Moore to several other farms which were reported to be attacked by the same pest. Of these one belonged to Mr. Quick. This gentleman, the night before I came to Leamington, had lost more than an acre of good tobacco by the attack of caterpillars. Practically nothing had been left of it. Having heard, however, of the furrow plan, he at once ploughed one and the next night was delighted to observe by the aid of his lantern that it seemed to be an effectual barrier. I mentioned a few ways in which I thought Mr. Quick could improve his furrow and also told him of poisoned bran or spraying with Paris green as further remedies. There was evidently a good deal of scepticism in his mind and in the minds of some other farmers as to the efficacy of Paris green in any shape or form. Probably this was because they did not see dead caterpillars lying on the plants or on the ground where they had tried spraying. They could scarcely be expected to think of their having buried themselves and died in the ground. However, I told them to come down and see how the experiment with the poisoned bran resulted at Mr. Moore's.

The next farm visited belonged to Mr. Copeland. Here I saw the most discouraging sight I had witnessed anywhere in the district. From several acres of clover the caterpillars had spread out in a single night and attacked in enormous numbers about two acres of beautiful corn and ruined it. Not only had they attacked the leaves but they had eaten through and through the stalks themselves. In addition to the corn they had attacked two rows of peach trees that were about three years old. If one of these trees were given a quick shake numerous caterpillars would fall from their hiding place among the foliage to the ground. Here again Mr. Copeland, having heard of the furrow and holes had resorted to this device to save the rest of his crop. It was interesting to see the host of caterpillars in the large holes he had made. So strongly did he trust to his furrow and holes that he was leaving to sun to do the work of destroying the caterpillars for him. Practically none seemed to be escaping, but I advised their immediate destruction in whatever way he wished, whether by boiling water, by kerosene, or by pounding with a stick as his neighbor had done.

Several more farms were visited and the best remedies I knew of explained to the farmers, many of whom had no idea of what they ought to do.

On my return to Mr. Moore's in the afternoon I helped him to make up what little bran he had into a poisoned mixture. The method I employed was to sweeten some water with black-strap, then moisten the bran with it and add the Paris green little by little to the moistened bran, mixing it thoroughly. I believe that a better and easier way would have been to make a paste of the Paris green with a little water and then add this gradually to the moistened bran and mix thoroughly. The trouble with the former method was that in spite of every precaution the Paris green tended to form flakes and could with difficulty be got to mix up finely with the bran. It was impossible, however, to get any more bran or shorts in the town, so we used flour and Paris green, mixing them dry. This was put on by means of a Planet Junior hand-drill, a very convenient method. Mr. Moore promised to observe by lantern light the results of our experiments with the bran and flour mixtures respectively. So after watching some spraying of hedges around a clover field, I returned to the town.

Late that night Mr. Moore met me in town and seemed very much pleased with the experiments. He reported the poisoned flour a decided success. He had less to say about the poisoned bran.

Illness during Sunday, July 28th, prevented my visiting any of the operations which I heard were going on all that day. A few farmers, however, met me and made enquiries how to fight the pest. At the request of several of the most intelligent farmers, I arranged early Monday morning for the publication and distribution of 1,000 leaflets giving instructions how to combat the caterpillars. Having seen to this and visited two infested farms where I saw that the foe was still under control I felt compelled by continued illness to return to Guelph at once.

It may be of interest to note that on at least two farms large flocks of cowbirds were seen feeding upon the caterpillars. I looked for signs of Tachina flies and other parasites, but saw none attacking the caterpillars; these were, however, great numbers of cocoons of Braconids to be found on the clover leaves. I brought some of these home and reared several adults from them.

Respectfully submitted,
L. Cæsar.

TWO-WINGED FLIES.

By Rev. Thos. W. Fyles, D.C.L., F.L.S., Levis, Que.

Two-winged flies seem to be everywhere in evidence. They are met with as far north as man has made his abode; and they abound in tropical regions. In light or darkness, be the weather fair or foul, in early Spring and late Autumn—aye, and under favorable circumstances in Winter also—two-winged flies are to be found.

Baron Osten Sacken, in his "Catalogue of the described Diptera of North America," gives the names of no less than 4,077 species of these insects; and doubtless there are many more unnamed species, belonging to the order, that will be found as time goes on and dipterologists increase. The same distinguished naturalist groups the flies into 64 families. It may well be believed that such formidable numbers are deterrent to the study of the Diptera.

Moreover, there is, I think, a prejudice, formed in early life, against the two-winged flies. The annoyance caused by house-flies, gnats, and cattle-flies, the abominable character of the blow-fly, the accounts of the *tsetse* and other hurtful species, all tend to create an utter dislike to the Diptera that is hard to overcome. I know that as a boy I was not much impressed by the story—told as a warning—of the ill-famed and ill-starred Roman Emperor who amused himself by killing flies. Questions arose in my youthful mind as to whether, in so doing, he was not acting as a public benefactor; and I am inclined to think that many a mother who in the nursery, would tell her children not to be cruel and kill flies, would, in the kitchen, spread a sheet of "tangle-foot" without compunction.

Yes—the order Diptera is not generally regarded with favor. Nevertheless, as Mr. Macy says in *Silas Marner*, "a fly is a fly, though it may be a hoss-fly,* and the habits of even this depreciated "hoss-fly" are so remarkable and its life-history is so strange, that, duly observed, they cannot fail to interest.

Undoubtedly many of the two-winged flies cause annoyance, both to man and beast; some are highly destructive to our food-supplies; some, on the other hand, are useful in keeping down the numbers of other insects, and others again, in consuming animal and vegetable substances that would cause harmful exhalations.

I shall endeavour to guard against wearying my readers with minute descriptions of many species. I hope to kindle an interest in the Diptera by telling of peculiarities in the structure and habits of some of the more remarkable of the kinds that have come under my notice.

The first family in Osten Sacken's list is the *Cecidomyiidœ* a very important group of insects. In it come two of the worst insect pests that have troubled the Agriculturist, viz., the Hessian Fly (Fig. 33), *Cecidomyia destructor*, Say, and the Wheat Midge, *Diplosis tritici*, Kirby (Figs. 34 and 35).

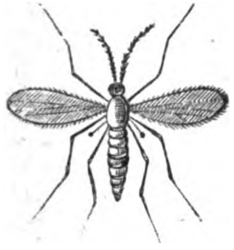

Fig. 33.—Hessian Fly —greatly magnified.

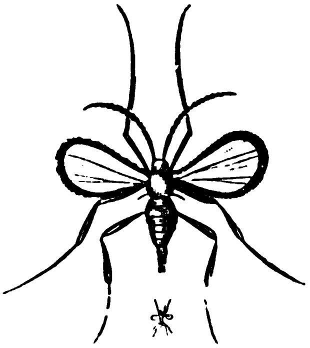

Fig. 34.—Wheat Midge—natural size shewn below.

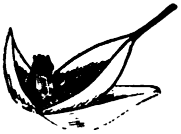

Fig. 35.—Wheat Kernel attacked by Midge.

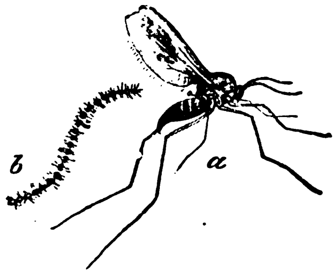

Fig. 36.—Willow-gall Midge—*a* the fly, much enlarged, *b* antenna highly magnified.

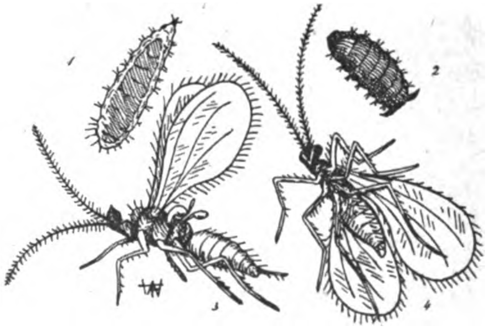

Fig. 37.—Diplosis grassator—1 larva, 2 pupa, 3 fly, side view, 4 fly, under side (original).

Of *C. destructor*, two broods appear in the year—one in May, the other in September. Each female fly lays about 30 eggs, on the blades of wheat, or of some other kind of grass. The eggs are minute, cylindrical, red points.

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*"And you're a doctor, I reckon, though you're only a cow-doctor—for a fly's a fly, though it may be a hoss-fly," concluded Mr. Macey, wondering a little at his own "cuteness."—*Silas Marner*, ch VII

They hatch in a week if the weather is warm; and the little white maggots work their way down between the leaf and the stem of the plant, till they come to a joint; there they commence to drain away the juices of the plant. About the first of June, the maggots go into what is called the "Flaxseed stage," because of the shape and color of the pupa case, or "puparium." The perfect insects appear in August, and lay their eggs for the second brood. Where Fall Wheat is grown it should not be sown till September; and Spring Wheat should not be sown till the end of May.

Diplosis tritici became very destructive in Lower Canada in 1834. In 1856 it was estimated that the loss on wheat in Canada, occasioned by the Midge was $2,500,000. The perfect insect is a minute, orange-colored fly, with black eyes, yellow legs, and wings that resemble thin films of mica. It makes its appearance when the wheat is in flower; and the female lays her eggs in the floret—the harm done by this insect is directly to the kernel (Fig. 35). The maggots get their growth in three weeks, and then wriggle to the ground and bury themselves, remaining unchanged through the Winter, and going into pupa in the Spring. The flies come forth in the end of June. Because of the damage done by this insect, and because Western flour can be bought so cheaply, our farmers in Quebec Province have, very generally, abandoned the growth of wheat.

A very interesting Cecidomyian is *C. strobiloides*,, Osten Sacken (Fig. 36). This fly lays an egg in the terminal bud of a shoot of sallow. The little orange-colored grub that comes from the egg so affects the bud, that it develops into a good-sized cone-shaped gall, which becomes dry and hard as the Winter advances. In the centre of this gall, and in a delicate, membraneous cocoon, the grub remains till early Spring, when it changes to a pupa. In April or May the perfect flies appear. When I was studying these creatures I opened some of the galls to watch the changes of the insect, and, as I thought, to aid the prisoner to escape, but the interference did harm; the fly from the open gall was always defective—as we say "crippled." It seemed as if the effort on the part of the insect to work its way upward, was absolutely necessary to the attainment of its higher life. And in this we have one of Nature's many parables.

A fly of great economic importance is *Diplosis grassator*, Fyles (Fig. 37), which in this country preys upon and keeps down the numbers of the dreaded *Phylloxera vastatrix*, Planchon.

The story of my discovery of this insect is as follows:

In the summer of 1882, I spent some time at Como, on the Ottawa with my friends, Mr. and Mrs. I. J. Gibb. Growing over the fences of the highway which ran through their estate, and extending for many yards, were several native vines. They were badly infested with *Phylloxera vastatrix*. As this pest was then exciting much attention, I was pleased with the opportunity of studying its habits. I soon found that at this place it was assailed by a formidable foe, an orange-colored dipterous larva. The business-like way in which this creature gave the *quietus* to the larva of the Phylloxera aroused my curiosity, and I resolved to study the species carefully. Accordingly I took a mass of the affected foliage home to Cowansville, where I then resided, and arranged for fresh supplies, properly secured, to be sent to me by post. At home I spent much time at the microscope, observing the structure, habits, and metamorphoses of the species; and I made, with the utmost care, drawings of it in its larval, pupal, and imago stages.

The Annual Meeting of the Entomological Society of Ontario was held that year in Montreal, and was attended by a number of scientists from the

United States. Among them were Professors Lintner, Hagen, and Riley. I brought the insect under the notice of the meeting. No one present professed an acquaintance with it, except Dr. Wm. Saunders (see 13th An. Rep. Ent. Soc. of Ont. p. 10); but Dr. Riley, from the description given, and the specimens shewn, pronounced it to be a species of Diplosis.

I then wrote to Dr. Williston, sending him particulars, and asking him for information He very kindly replied, furnishing me with references to a number of species of Cecidomyia, and adding:

"It is probable that your species is not one of these, but new. Still I should examine the subject as far as possible. At all events its life's history is interesting, and worthy of immediate publication. *L. vitis* is the only species in which the imago and complete life history are known."

Acting upon Dr. Williston's suggestion, I sent the life-history of the insect, with illustrations to the "Canadian Entomologist."

They appeared in the December number of the magazine (Can. Ent. Vol. XIV, p. 237), together with a confirmatory statement from Dr. Saunders, the editor. The number was printed January 10th, 1883.

On the 27th of February, 1883, I received a kind letter from Dr. Hagen, who said, with reference to *D. grassator*—specimens of which I had sent him: "The fly is, I think, a Cecidomyia. I think it is not sure that it belongs to Diplosis. At least the reticulations of the wing differ in having the median veins straight, and the fork at the hind margin wanting. You will see in Osten Sacken's Catalogue, that the museums do not possess this type for Cecidomyia. I have gone through the literature, and find, till now, that your species is not described."

D. grassator is not a gall-producer like certain Cecidomyians spoken of by Walsh and Riley.

Its larvæ do not extract sap from galls as do those of *C. albovittata*, Walsh.

They do not feed on fungi, like those of *D. coniophago*, Winnertz.

They have not horny hooks at the tip of the abdomen like those of *C. populi*, Duf.

They are not white, like those of *D. caryæ*, O.S.

They do not go under ground to pupate like those of *Lasioptera vitis*, O.S.

The pupa has not two oblique processes from the anal end, like that of the *Lucopis* mentioned by Riley.

The imago has not violet-blue spots, nor are tibiæ and tarsi annulated with black, as in *D. maccus*, Lœw.

It is not brownish-black with white hairs like that of *C.* (*Diplosis*) *Pini*, De Geer.

Its thorax is not blackish above with a golden pubescence as in *Lasioptera vitis*, O.S.

I think I may say with all confidence, that my account of the insect, with the notes of Drs. Hagen and Saunders, and the illustrations given afford sufficient specific distinction for the recognition of the insect.

If *D. grassator* had been carried to France with the American vines introduced by the Duchess of Fitzjames, the loss to the Gironde, amounting to $100,000,000, might have been lessened, and the vineyards ultimately saved.

In the next family, the *Pulicidæ*, Packard and others have placed the Fleas. These creatures, though they have no wings, are shown by the form and habits of their larvæ, to be rightly placed. Of their many species *two* are very well known—*Pulex irritans*, Linneus, the Human Flea, and *Ceratopsyllus serraticeps*, Gervais, the Cat and Dog Flea (Fig. 38).

About fifty years ago an ingenious Italian (said to have belonged to a good family in his own land), was employed by Sir Edmund Head, as steward, and afterwards in the same capacity by the Stadacona Club of Quebec. Bertolotto—for that was his name—observing the structure of the flea, its great strength, and its rigid, protective armor, conceived the idea of harnessing the insect, and turning it to account for the amusement of himself and his friends.

And here I would say that I am indebted for most of the information that I can give, respecting Bertolotto and his Fleas, to D. Jewell, Esq., broker, who was intimately acquainted with Bertolotto, Lt. Col. Gray of H. M. Customs, who was a member of the Stadacona Club during the time of Bertolotto's stewardship, and the Rev. E. A. W. King, M.A., Rector of St. Peter's, who witnessed one of Bertolotto's exhibitions in Boston, Mass., at the time of the American Centennial (1876). These gentlemen are all living in Quebec.

Bertolotto broke his fleas of the habit of jumping, by confining them in a glass tube about half an inch in diameter. He fastened a silken tie around the waist of each; by means of this he could attach them to various contrivances. He made a small carriage, fastened fleas inside as passengers, a flea on the box as coachman, and a flea behind as footman or guard. Then fastened fleas to the pole as horses. These soon found that "a long pull, a strong pull, and a pull all together," was the way to advance; and so the equipage moved on, to the delight of the observers. A number of like contrivances made up a show, that from its very novelty, became popular, and consequently remunerative; and Bertolotto travelled to exhibit it.

I have been told that, on a certain occasion, when giving a parlour entertainment, before some exalted personages, Bertolotto discovered, to his dismay, that his leading performer, his best trained flea, which he had named Napoleon, had made its escape. In the warmth of his southern temperament he bewailed his loss—"Oh, my Napoleon! My Napoleon is gone! What shall I do?"

As the escape of Napoleon the Great from Elba occasioned dismay amongst the powers of Europe, so the escape of Napoleon the Little occasioned disturbance in the minds of the ladies present—they anticipated dire attacks.

Presently one of the fair ones hastily left the room. Soon afterwards a maid came in, bearing a plate, and on the plate a glass, and under the glass *a flea.* Bertolotto welcomed it with delight. But telling the story afterwards he said, "Lo and behold, *it was not my Napoleon at all!*"

The Rev. Mr. King thus described the performance he witnessed:—"Bertolotto stood behind a counter, and had a sheet of glass before him. His visitors were seated round the room. Three or four persons came up to the counter at a time. Bertolotto first exhibited a small house, that he called the "Fleas' Hotel"—he had about 50 fleas in it. Then *an uneducated flea*, fastened by a fine gold chain to a small ball, was shown. This flea jumped about wildly. After that a Flea Orchestra was exhibited; about twenty-five fleas, each bearing a minute imitation musical instrument, were placed in a semicircle, and went through the motions of playing upon their instruments, while a musical box gave forth a tune. The Prince of Wales in India was represented; a toy elephant bearing a howdah was set out; fleas represented the prince and his attendants, and a flea was the mahout. A Military Review; the Coach and Horses; a Flea working a windlass that brought up a small bucket, etc., etc., were shown."

Questioned about the feeding of his fleas, Bertolotto said that he fed them only at night; and he showed a red place on his wrist—a token of the *phle*-botomy he had undergone the night before.

When he was asked, "Where do you get your fleas?" he replied, "Not in Massachusetts; the fleas here are too poor—they are no good. *I have to send to Canada for the good ones!*"

Mr. Jewell has given me an original ticket for Bertolotto's show. It reads:—

"Signor Bertolotto's
original exhibition
of the
EDUCATED FLEAS
Now open at 39 *Union Square,*
From 10 a.m. to 6 p.m.
Admission 25c
Programmes in the Exhibition Rooms."

Between the words *original* and *exhibition* there is a small engraving of a flea with a soldier on its back.

The family Simulidæ is an objectionable one.

I lived many years ago in a cottage near a brook, which meandered through a valley, and fell into a neighboring lake. This brook abounded with the pretty little trout, *Salmo fontinalis*......It also abounded with the larvæ of the Black Fly of the North, *Simulium molestum*, Walker, which are said to be harmful to the young fry of the fish.

The Black Fly itself is a compact insect having a stout proboscis with which it inflicts a more severe wound than that given by the mosquito. I have seen the faces and necks of children running with blood from the bites of this insect.

There is a stately White Willow over-shadowing my yard at Levis, and other trees are near. In the calm summer evenings, when the light has been fading, I have often sat upon my verandah and watched the mazy dance of *Plecia heteroptera*, Say, plainly seen against the western afterglow. This insect is a *black* fly—entirely black; but it is "guileless of offence." It belongs to the family Bibionidæ.

The disreputable family of mosquitoes known as the Culicidæ have been ably set before us by Howard, Smith and other writers. Our common species at Quebec is *Culex consobrinus*, Robineau-Desvoidy.

Drain the land, stock the pond with fish, keep the water-butts closely covered, banish the mosquitoes—"their room is better than their company."

A very interesting family of two-winged flies is that of the Tipulidæ. The typical insect of this is the Tipula, Crane-fly, or Daddy-long-legs.

The finest of our Quebec Tipulidæ is *Tipula flavicans*, Fab. It has an expanse of wings of nearly two and a half inches; and its legs when extended reach over a space of three and a half inches diameter. The wings of this insect are prettily veined and are spotted with brown and white. Its long abdomen is light with dark brown markings.

A very pretty Crane-fly is *T. trivittata*, Say. It has three smoky brown bands crossing the wings, and the wing tips are clouded with the same color.

A very common insect in our woods is *T. cincta*, Lœw. It is very Quaker-like in its coloring, having body, legs and wings of a sober drab.

Smaller and brighter in color is *T. ferruginea*, Fab. Its prevailing color is orange-red.

Pedicia albivitta, Walker, is a larger and handsome Crane-fly. It may be readily distinguished by its brown costa and the obtuse-angled triangle raised upon it. In the male of the species there is a brown line running from the obtuse angle to the hind margin of the wing.

In June, 1896, I took, in the grounds of my friend Mr. Wheeler, at Bergerville, a fine species of *Ctenophora*. Its head and thorax are jet black, polished; its abdomen is black, excepting the two first segments which are bright red. The legs are red. The wings are somewhat smoky; their veins are dark brown distinctly marked, and there is a brown spot on the costa at about one-third the length of the wing, counting from the tip.

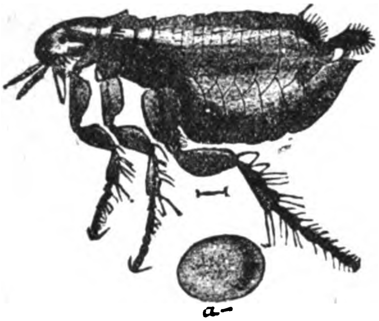

Fig. 38. Cat and Dog Flea, greatly magnified; *a* the egg.

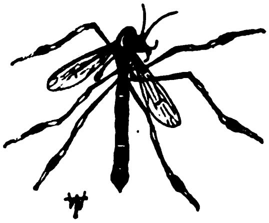

Fig. 39. *Bittacomorpha Clavipes.* (original).

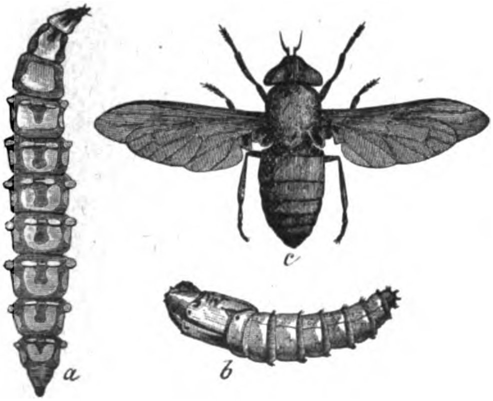

Fig 40. Black Horse Fly; *Tabanus atratus.*

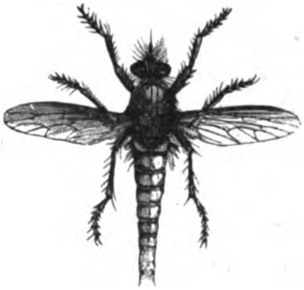

Fig. 41. Robber Fly; *Asilus.*

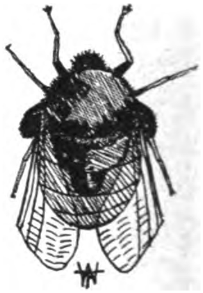

Fig. 42. *Pterodontia flavipes* (original).

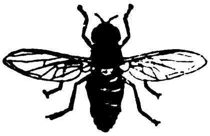

Fig. 43. Syrphus Fly.

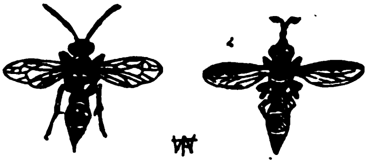

Fig. 44. 1. *Odynerus tigres.* 2. *Temnostoma bombilans* (original).

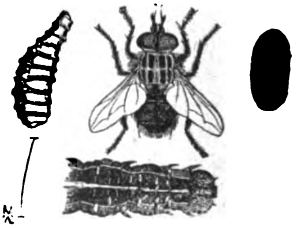

Fig. 45. Tachina Fly, parasite of the Army-worm.

But I think the most remarkable of the near relatives of the Tipulidæ is *Bittacomorpha clavipes*, Fabricius (Fig. 39). This creature has transparent wings, a thin body, and long legs banded with white. When it flies you do not see its wings—it seems to float like a film. It is an insect fairy.

One female Crane-fly will lay about 300 eggs. These are small, black and glossy. They are laid in, or close to, the ground. The grubs that come from them are familiarly known as Leather-jackets. They feed on the roots of grasses, corn, etc., and sometimes do much damage. Unlike other maggots the larva of the Crane-fly has a well-marked head, black and horny, with a pair of strong black jaws; and a pair of small horns. At the blunt extremity of the creature are four tubercles. The grubs turn to pupæ in the ground; and the flies appear towards the end of summer.

Fall ploughing, rotation of crops, lime-dressing for the land, drainage, all help to keep the numbers of the Leather-jackets down.

The perfect flies are quite harmless. They are remarkable for the seeming ease with which they part with their limbs. I find it rather a difficult matter to obtain perfect cabinet specimens of them.

In the Cœnomyiidæ comes the *Cœnomyia pallida* of Say. This fly is figured by Gosse in the *Canadian Naturalist* p. 199. It is believed to be the same as the *C. ferruginea* of Europe. I have four fine specimens in my collection. They were taken in the Eastern Townships, at different times. The fly is fawn-colored throughout, with large blue-black eyes.

The family Stratiomyidæ numbers some fine insects. One of them is quite common at Quebec, viz., *Stratiomyia obesa,* Lœw. It has a yellow face jet black eyes, a black body marked with yellow stripes; its legs are yellow, and its wings are light fawn-colored, darker on the fore part of the wing. It is a handsome fly.

A family of objectionable insects is the Tabanidæ. Amongst them comes that annoying fly, *Chrysops fugax,* Walker, which does its worst to spoil the entomologist's pleasure in the woods and fields, especially when there are cattle near. This fly is black, and has a brown patch in the centre of the wing. There is no mistaking it—its incessant audacious attacks make it known.

Happily we have not in Quebec the formidable *Tabanus atratus,* Fab. (Fig. 40). But the fine fly *Tabanus rufus,* Palisot Beauvois, often made its appearance round my stable when I kept a horse and cows. It is three-quarters of an inch in length of body, and an inch and a half in expanse of wings. Its prevailing color is brick-red.

To the Asilidæ belong the Robber Flies (Fig. 41), which are so named from their habit of pouncing down upon the backs of other insects and destroying them.

I have seen the King Bird alight, with the utmost daring and dexterity, upon the shoulders of the Hen Hawk, and peck at its head to drive it away from the neighborhood in which the little King Birds were gathered. And the Robber Flies do not hesitate to pounce down upon such formidable insects as wasps and bees—not merely to put them to flight, but to drain away their life-juices. Our commonest kind is *Asilus Novæ-Scotiæ,* Macquart.

The Bombylidæ are an interesting family. From their habit of hovering over blossoms, they are called Bee Flies. *Anthrax fulviana,* Say, is quite common at Quebec. Its brown body is covered with a yellow down, and its wings have an irregular brown border along the costa. A less bulky and prettier fly is *Anthrax sinuosa,* Wiedemann. This is dark brown in color, and its wings are of a rich warm brown, but have a clear space along the hind margin. In the genus *Bombylius* we have *fratellus,* Weid., *major,* Linne, and *pygmæus,* Fabricius. The last named is a veritable fairy. Its small brown body is edged with yellow; its wings are richly spotted with black, and have a brown bar along the costa; and its proboscis extends in a straight line from the head—as is the case also with *fratellus* and *major*.

Of the Leptidæ I have taken *Leptis Boscii*, Macquart, at Quebec; of the Empidæ, *Rhamphomyia umbrosa*, Lœw.; and of the Therevidæ, *Thereva senex*, Walker.

A fly of strange appearance is *Pterodontia flavipes*, Gray (Fig. 42). It is oval in shape and raised, and looks like a large Lady-bird. Its colors are black and red. It comes in the family Cyrtidæ. I have taken a few specimens of this fly at the Gomin Swamp.

The family Syrphidæ contains a number of remarkable flies. Some of them have a strange resemblance to wasps (Fig. 43). One day when seeking in the woods for additions to my collections of the Vespidæ, I saw what I took to be a fine female of *V. arenaria*. I caught it and found that it was a specimen of the Syrphid, *Spilomyia fusca*, Lœw.

Milesia eccentrica, Harris, resembles a yellow wasp, and so in less degree, does *Chrysotoxum derivatum*, Walker.

Temnostoma bombylans is a handsome fly belonging to the Syrphidæ. I do not know its history; but the creature bears so striking a resemblance to *Odynerus tigres*, that I suspect it to be a familiar of that wasp (Fig. 44).

Sericomyia militaris, Walker, is quite common at Quebec. It probably derives its name from the yellow bands on its abdomen, which look like the facings of a soldier's coat.

Spilomyia quadrifasciatus, Say, is a large, handsome fly. Its long, cylindrical abdomen has a conspicuous golden band round the upper part.

The rat-tailed maggots of *Eristalis tenax*, Linneus, thrive in polluted water. The tail is a breathing-tube. The flies of the species may easily be mistaken for drones of the Hive Bees, and are commonly called Drone Flies. Besides this species, *E. transversus*, Wied., and *E. dimidiatus*, Wied., are common at Quebec.

Volucella evecta, Walk., is very common with us. Its Larvæ are found in Bumble Bees' nests.

I have taken three specimens of the pretty fly *Conops furcillatus* upon flower-heads. The larvæ of the Conopidæ are said to be parasitic in the bodies of Bumble Bees.*

In the Œstridæ we find the Bot-flies of the horse, ox, sheep, etc. The Horse Bot-fly, *Gastrophilus equi*, Meigen, lays its eggs on the fore-legs of the horse. The larva, leaving the egg, causes irritation and is licked off by the horse. It is carried in the saliva to the stomach of the animal. There it attaches itself, and from thence on getting its growth, it is voided.

The larvæ of the Ox Bot-fly or "Warble-fly," *Hypoderma bovis*, Fab., cause tumors in the back of the ox, which injure the skin—a grubby hide is of one-third less value than a sound one.

The Sheep Bot-fly, *Œstrus ovis*, Lin., lays living maggots in the nostrils of the sheep. These crawl into the frontal hollows of the sheep's head, and get their growth there.

The family Tachinidæ is a large one, Fig. 45. In it we have *Histricia vivida*, Harris, a showy bustling insect, with a rounded, red abdomen, set with black bristles. It is common and well known.

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*"The Conopians undergo their transformations in the bodies of humble bees, their young subsisting on the fat contained within the abdomen of their luckless victims."—Harris, "Insects Injurious to Vegetation," p. 611.

Another fine insect in the same family is *Echinomyia florum*, Walker. It is of a glossy blue-black, with light sienna-colored wings, and has a yellow patch on either side of the first joint of the abdomen.

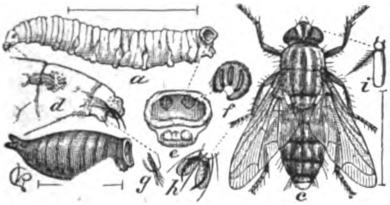
Gonia capitata, DeGeer, is a prettily banded fly, also in the Tachinidæ. It frequents flower-heads, and was abundant at Quebec two years ago.

A fly of strange habits is *Sarcophaga sarraceniæ*, Riley, Fig. 46, belonging to the family Sarcophagidæ. In the pitchers of the plant, *Sarracenia purpurea*, will be found a decaying mass of insects, which had been attracted by, and drowned in, the liquid that the pitchers contain. Into this corrupting mass the fly, *S. sarraceniæ* drops her eggs. The maggots from these thrive in pollution and, after attaining their growth, bite a way through the side of the pitcher and fall into the surrounding herbage, in which they undergo the pupal change.

The Muscidæ form another large family, Fig. 47. In it we find *Musca domestica*, Linn., *Lucilia Cæsar*, Linn., *Sarcophaga carnaria*, Linn., household pests too well known.

In the Anthomyidæ comes the troublesome *Anthomyia raphani*, Harris, which spoils our radishes.

The ochre-colored Dung-fly, *Scatophaga stercoraria*, Linn., is common. It is a representative of the Cordyluridæ.



Ffg. 46.—Sarcophaga sarraceniæ.

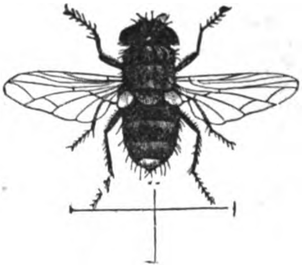


Fig. 47.—A Muscid Fly.

Among the Ortalidæ is found that most remarkable and handsome fly, *Pergata undata*, Wied., which is figured on page 610 of "Insects Injurious to Vegetation" by Harris. I have taken several specimens of this fine fly in the Eastern Townships.

Another beautiful insect belonging to this family is *Chætopsis ænea*, Wied. It has a glossy blue body, and pretty banded wings. I have found its maggots preying upon Lepidopterous larvæ, in the stems of bulrushes, and have raised the perfect insects from them.

Of insects in the family Trypetidæ I have taken at Quebec, *Straussia longipennis*, Wied., *Eutreta sparsa*, Wied., *Eurosta solidaginis*, Fitch, and *Tephritis albiceps*, Lœw.

It is *Eurosta solidaginis* that inhabits the large, round pithy galls that are found on the Golden Rod.

In the Piophilidæ comes the well known *Piophila casei*, Linn., whose larvæ are the "hoppers" found in cheese.

There are some other families of Diptera to which it does not come within my present purpose to refer. I have endeavored to compress within the limits of this article such information as seemed to me likely to arouse an interest in the two winged flies, and to convey ideas of their number, variety and habits. Every species has doubtless its peculiar life-history —known or unknown, to man. Every species fulfils its purpose in the economy of Nature. They all bear testimony to the marvellous resources of the Divine Creator, who *in Wisdom hath made them all.*

SUMMER MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

A summer meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, July 4 and 5, 1907. Through the kindness of President Creelman the members from a distance were hospitably entertained in the College residence during their visit, the ladies of the party being provided for in the Macdonald Hall. The number in attendance was smaller than anticipated, many who had been looking forward to taking part in the meeting being prevented from coming by a variety of causes. A very satisfactory audience, however, was made up by the Summer School of Ontario teachers from the Macdonald Institute, and several students and members of the College staff. The sessions began on Thursday afternoon in the lecture-room of the Biological Department, the President of the Society, Dr. Fletcher of Ottawa, being in the chair. Mr. H. H. Lyman, of Montreal, read a paper on the distinctions between *Thecla calanus* and *Edwardsii*.

Dr. Brodie, of Toronto, described the life-history of a colony of the Tent Caterpillar and related his experiences in breeding a large number during a series of years in order to observe the effects of parasites upon them.

Dr. Fletcher gave an account of a visit he recently paid to Massachusetts and described what was being done to control the Brown-tail and Gypsy moths by the importation of parasites from Europe and by practical field operations.

Mr. C. W. Nash, of Toronto, spoke on "Balance in Nature," in which he described in a very interesting manner some of the numerous checks and counter-checks which are provided in order to prevent the undue preponderance or the extermination of any particular species, and showed how this balance had been upset by man's disturbing agency and the difficult problems that had arisen in consequence. A discussion followed which was participated in by the chairman, Dr. Brodie, Prof. Bethune, Mr. Jarvis, Mr. Cæsar and others.

In the evening the session was held in the Nature Study Lecture-room of the Macdonald Institute and was attended by the Summer School and a number of others from the town and College as well as by the members of the Society. Dr. Henry Skinner, of Philadelphia, gave a highly interesting lecture on "Insects as Carriers of Diseases." Mr. C. W. Nash followed with a lively address on "Instinct *vs.* Education" and Dr. Fletcher spoke in his usual attractive manner on "Nature Study as a Means of Education." The evening was thoroughly enjoyed by all present and no doubt the school teachers carried away with them much information and many impressions that will be of value to them in the future.

The next day, July 5th, was given up to an excursion to Puslinch Lake, a picturesque sheet of water about nine miles from the College. The Summer School joined in the picnic, making up a party of more than sixty in all. The day was spent in collecting botanical and entomological specimens and other objects of interest. At the close short addresses were given by members of the College staff and others on various specimens that had been brought in, including fresh-water shells, insects, and plants. The meeting on the whole was so delightful and successful an experiment that it will no doubt be repeated in future years and become annually more attractive and well-attended.

ENTOMOLOGICAL RECORD, 1907.

By Dr. James Fletcher and Arthur Gibson, Ottawa.

The season of 1907 in Canada will long be remembered for its unusual and irregular character. The spring, right across the continent from the Atlantic to the Pacific, was cold, dry and late. As a consequence, insects of all kinds were remarkably scarce, and the paucity of insect life in April and May had a direct effect on bird life as well as in many places also upon the fruit crops. Where fruit growers were fortunate enough to have colonies of bees near their grounds there was a conspicuous advantage to the crop from the much larger number of flowers which were fertilized by these useful agents and friends of the fruit grower. The main migration of warblers and other insect-eating birds was much delayed by cool weather and the tardy revival of insect life. The exceptionally backward nature of the season continued throughout the summer and was only in a measure compensated for by the long open autumn without killing frosts. From an entomological point of view, we seem to be passing through a period of "poor years," which began with the year 1901. Notwithstanding this, there has perhaps never been a time when better work has been done in investigating the insect fauna of the country. This is directly due to the far higher appreciation of the value of entomological studies, the greater number of workers and the improved facilities for those studying insects to get into touch with others of similar interests.

The appearance of several elementary works on various branches of the subject, such as the Insect Book, the Butterfly Book and the Moth Book, have acted as a stimulus to direct the attention of students to, and encourage them in the study of entomology. Local Natural History Societies, Horticultural Societies and schools, in all parts of the country, are devoting more time than ever before to the habits of insects, and the observations of their members are being published for the help and encouragement of others. Agricultural journals now include regularly articles upon the insect foes and friends of the farmer. The value of these articles depends entirely upon their scientific accuracy, and there is a constant demand for information on the life histories of insects. Such facts as this information is founded upon, can only be learnt by careful and close personal observation by the trained entomologist. The members of the Entomological Society of Ontario, located in all parts of the Dominion, are collecting assiduously and, in the pages of the *Canadian Entomologist* and of the Annual Reports, are making known their discoveries for the benefit of the whole country.

During the past year, in addition to the constant and important work of many collectors who have not the opportunity to travel from their own home fields of action, several collectors have penetrated to little known fields of work and have brought back many treasures, which in due time will be worked up and reported upon; thus, useful knowledge will be disseminated as to the geographical distribution of species, their life habits, and varying foods in widely separated localities. Of the officers of the Geological Survey Department, Mr. Joseph Keele, collected during the past summer along parts of the Stewart and Pelly Rivers in the far off Yukon. Mr. W. J. Wilson again visited the Hudson Bay slope and was this year along the height of land. Mr. T. P. Reilly, of the Alaska Boundary Survey, and Mr. Douglas H. Nelles, of the same Survey, brought back small collections, the former from near Sixty Mile River, along the 141st meridian in the Yukon, and the latter from Bartlett Bay, off Glacier Bay, Alaska. Mr. Andrew Halkett, Naturalist of the Department of Marine and Fisheries, collected during the last summer in the Provinces of Saskatchewan, around the Qu'Appelle Lakes, and in Alberta around Beaver Lake, which localities he was visiting to study the local fishes, but found time to collect several interesting insects. Mr. J. B. Wallis, of Winnipeg, collected at Banff, in the Rocky Mountains, and at Peachland, in the Okanagan Valley, B.C., where he made large collections of insects during July and August. Dr. E. M. Walker, of Toronto, spent the summer at the Georgian Bay Biological Station, at Go Home Bay, Ont., where he made interesting observations on aquatic insects. He also took short trips to Nepigon and Fort William, where he made important collections of orthoptera and odonata. In the month of June, Mr. W. D. Kearfott, the well known microlepidopterist, of Montclair, N.J., paid a visit of a few days to Ottawa, where he made large collections at various places in the district. Dr. Henry Skinner, of Philadelphia, also visited Canada and, after addressing our members at the summer meeting in the beginning of July, proceeded with Dr. Fletcher to Nepigon where two days were spent. They then went to Aweme, Man., and had four days collecting with the Messrs. Criddle, after which a long trip was taken in company with Mr. T. N. Willing, along the Canadian Northern Railway; districts visited were, the Goose Lake district west of Saskatoon, Duck Lake, Prince Albert, Kinistino, Radisson, Lloydminster, Edmonton, Calgary, Banff and Laggan. From Laggan Dr. Fletcher went alone to Vancouver Island. Large numbers of insects were collected in all localities mentioned above. Mr. Gibson spent the first three weeks in September at Rostrevor, on Lake Rosseau, Muskoka, and notwithstanding the unfavorable season, collected enough insects to indicate the richness of the locality. Mrs. Nicholl, of Bridgend, South Wales, this year made a third expedition to the Rocky Mountains and British Columbia, for the special purpose of collecting butterflies. In part of her expedition she was accompanied by Mr. F. H. Wolley-Dod, and, on the whole, these trips were very successful. Mr. Dod has kindly provided us with several of Mrs. Nicholl's records in addition to his own, and there is much of the material still to be worked up.

We have again to express our great obligation to the leading specialists in the United States for their constant courtesies in naming material for our Canadian collectors. Dr. Howard, of Washington, with his assistants; Dr. J. B. Smith, of New Brunswick, N.J., Prof. H. F. Wickham, of Iowa City, Mr. W. D. Kearfott, of Montclair, N.J., and Mr. E. P. VanDuzee, of Buffalo, have placed us all under deep obligations to them. Sir George F. Hampson, of the British Museum, has not only sent several copies of his valuable catalogue to those who have contributed specimens to the British Museum, but has also corrected the names of some species which had been standing under wrong names in Canadian collections for some years.

LITERATURE.

Among the many valuable works, reports and separate papers which have dealt with Canadian insects and which have appeared during the past year, special mention may be made of the following:

BUSCK, August, Revision of the American Moths of the Genus Argyresthia (separate from Proc. U. S. National Museum, Vol. XXXII., pp. 5 to 24, plate IV., V.), Washington, D.C., 1907. In this important pamphlet, Mr. Busck gives a monograph of the American species of these most attractive and beautiful little moths. All the species are figured except three doubtful species which are unknown to the author. Of particular interest to Canadian collectors are *A. conjugella* which is occasionally destructive to apples in British Columbia and *A. thuiella,* which has been noticeably injurious to the

American Arbor-vitæ, or White Cedar, of Eastern Ontario and Western Quebec, for the past three years. With Mr. Busck's excellent paper there should be no trouble in recognizing any species that have been described.

Caudell, Andrew Nelson, The Decticinæ (a group of Orthoptera) of North America, ninety-four figures. (Separate from Proc. U. S. National Museum, Vol. XXXII, pp. 285-410, published May 23, 1907.) An important paper and one which will be of great help to those studying Orthoptera. Mr. Caudell deals in an exhaustive way with a group which has been found very troublesome to students. His opportunities to study a large number of specimens and also of having travelled extensively in the localities where many species occur have given him facilities which few have enjoyed. The figures given are excellent and will be of great assistance to those working at these difficult insects. Several published species have been reduced to synonyms and new genera have been erected, but the work is very thorough and all orthopterists will be grateful to the author for this timely monograph.

Chittenden, F. H., Sc.D., U. S. Department of Agriculture, Insects Injurious to Vegetables. Small 8vo. New York. Orange Judd Co., 262 pp., 163 illustrations. This is a handy little manual treating briefly of the best known insects which attack vegetable crops and giving the remedies usually applied. Preliminary chapters deal with the value of a knowledge of entomology, the classification of insects, practical agriculture and artificial remedies, and apparatus. Not only will this book be of use to gardeners, but it should be a convenient handbook for students and teachers.

Dyar, H. G., Report on the Mosquitoes of the Coast Region of California, with Descriptions of New Species. (Proc. U. S. Nat. Museum, Vol. XXXII, pp. 121-129). Although a paper of only a few pages, this article by Dr. Dyar will be read with much interest by our western dipterists, as it deals with many species which are found in British Columbia and some other parts of Canada. *Anopheles maculipennis* of the West is now *Anopheles occidentalis* D. & K. A majority of the species treated either have been already found in British Columbia or are sure to be discovered as more extensive collections are made. The value of securing the preparatory stages is shown in many instances in the present paper. Anyone having opportunities of rearing the larvæ of mosquitoes should be careful to save the exuviæ and forward them to Dr. Dyar with the specimens for examination, remembering always that a few perfect specimens are of far more value than a large number of broken ones.

Casey, T. L., A Revision of the American Components of the Tenebrionid sub-family Tentyriinæ (Washington Academy of Sciences, Vol. IX, pp. 275-522). October 18, 1907. In this important work Major Casey monographs in a thorough manner and brings up to date all that is known of "that part of the great family Tenebrionidæ, having the abdominal segments unmodified by a coriaceous hind margin and the middle coxæ enclosed externally by the sterna alone, without the intervention of a small piece attached to the coxæ and sometimes separating the sterna, known as the trochantin." This was Leconte and Horn's definition of the subfamily and has been adopted tentatively for the meantime. The author suggests that he may have overstepped the limit of prevailing conservatism in proposing new genera, but the high quality of Major Casey's work during many years has proved that although it has occasionally been somewhat severely criticised, on account of this very feature, and the great convenience and stability of a large proportion of his differentiations, these are being adopted more and more even by the most conservative. As in the case of his work on Staphylinidæ, noticed last year, much foreign material has been used in making comparison with American forms. The advantage of this is shown in many places. We trust that Major Casey may at no very distant date treat the other subfamilies of the Tenebrionidæ in the same thorough manner as he has done in this publication.

Gillette, C. P., Chermes of Colorado Conifers (Proc. Acad. Nat. Sciences, Philadelphia) January, 1907 (separates issued April 2, 1907), pp. 22, plates 11. This article by Prof. Gillette is the most important contribution towards our knowledge of the spruce gall lice which has yet appeared. It is copiously and beautifully illustrated and the different new species described are dealt with in an exhaustive manner. *Chermes Cooleyi* is the name given to the large and handsome gall found in British Columbia upon the Sitcha Spruce, and the gall, as well as the insect in all its stages of development, are figured and described with great detail. This paper will be welcomed by all homopterists who will be glad to have these different species characterized. In the past nearly all the gall making species of Chermes found on spruce have been called *Chermes abietis.*

Hampson, Sir. George F., (Bart.), Catalogue of the Lepidoptera Phalænæ in the British Museum, Vol. VI, Noctuidæ, 1906, pp. 532, plates XCVI to CVII. Sir George Hampson's new volume appeared early in the year and through his kindness and that of the Trustees of the British Museum was presented to several of the members of our Society who had helped by sending good specimens to the British Museum collection. This volume is of particular interest to Canadians from the large proportion of insects belonging to our fauna which are included among the 692 species described. Of the 322 coloured figures given on the plates no less than 141 species have been already taken in Canada or are quite likely to occur within our limits. The range of the present volume is "the Cucullianæ, the third of the fifteen sub-families into which the Noctuidæ are divided. This subfamily is characterized by its trifid neuration of the hind wing combined with spineless tibiæ and smooth eyes surrounded by eyelashes of bristle-like hairs. It forms a group of genera very closely related to the Acronyctinæ, the lowest of the subfamilies of the Noctuidæ Trifinæ." This volume is of great importance to all North American students. From correspondence with Sir George Hampson it is apparent that there are a great many species of North American Noctuidæ, of which good specimens would be most acceptable for the British Museum. It is manifestly to the advantage of everyone to help now by sending specimens to Sir George Hampson, particularly those concerning the identity of which there is any doubt. He will gladly examine and report upon them. It may be noted that Prof. J. B. Smith, who is one of ourselves, is closely in touch with Sir George Hampson and has been of great assistance to him in the volume now referred to.

Kearfott, W. D., New North American Tortricidæ; Transactions of the American Entomological Society, Philadelphia, Vol. XXXIII, No. 1, pp. 1 to 98. (Separate signatures mailed as issued between Feb. 2 and March 27, 1907.) In this article 159 species and 4 varieties are described as new, and of these 20 species are from Canada. This valuable contrib tion will be of great value to Canadian students of microlepidoptera, in whose behalf the author has been so untiring in his efforts. Many hundreds of specimens have been submitted to him from collectors in all parts of the country and he has been most generous in naming and returning authoritatively labelled material. Our Ottawa members not only had the great pleasure of meeting Mr. Kearfott when he paid us a short visit last spring but had the privilege of accompanying him to the field, where they got much valuable information as to the best ways of collecting and rearing microlepidoptera. Mr. Kearfott's enthusiasm was an inspiration.

The following is a list of the names and addresses of collectors heard from during 1907.

Anderson, E. M., Provincial Museum, Victoria, B.C.
Albert, Rev. Roger, Maisonneuve, Que.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bédard, Jos., Ste Croix, Que.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., c/o King Brothers, Quebec, Que.
Brodie, Dr. W., Provincial Museum, Toronto.
Bryant, Theo., Ladysmith, B.C.
Bush, A. H., 1105 Ninth Ave., Vancouver, B.C.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kalso, B.C.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Denny, Edward, 200 Mitcheson St., Montreal.
Dent, W. A., Sarnia, Ont.
DeWolfe, L. A., Truro, N.S.
Dod, F. H. Wolley, Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fletcher, James, Experimental Farm, Ottawa.
Fyles, Rev. T. W., Levis, Que.
Gibson, Arthur, Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harrington, W. H., P.O. Dept., Ottawa.
Harvey, R. V., Victoria, B.C.
Heath, E. F., Cartwright, Man.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph, Ont.
Keele, Jos., Geological Survey, Ottawa.
Keen, Rev. J. H., Metlakatla, B.C.
Létourneau, Jos., Exp. Farm, Ottawa.
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancouver, B.C.
McIntosh, W., St. John, N.B.,
Metcalfe, W., 288 Bank Street, Ottawa.
Moore, W. H., Scotch Lake, N.B.
Payne, H. G., Granville Ferry, N.S.
Perrin, Jos., McNab's Island, Halifax, N.S.
Russell, John, Digby, N.S.
Sanson, N.B., Banff, Alta.
Saunders, Henry, 21 Harbord St., Toronto.
Sherman, R. S., 2285 Sixth Ave., Vancouver, B.C.
Simpson, W., Dom'n Observatory, Ottawa.
Taylor, Rev. G. W., Wellington, B.C.
Venables, E. P., Vernon, B.C.
Walker, Dr. E. M., 99 St. George St., Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Williams, J. B., 125 College St., Toronto.
Willing, T. N., Regina, Sask.
Wilmot, E. S., Vernon, B. C.

Wilson, W. J., Geological Survey, Ottawa.
Winn, A. F., 132 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O.A.C., Guelph.

NOTES OF CAPTURES.

LEPIDOPTERA.

(Arranged according to Dyar's List of North American Lepidoptera, U. S. N. M. Bull. No. 52.).

RHOPALOCERA.

(Dyar's number.)

8. *Papilio daunus*, Bdv. Vernon, B.C., (Venables).

11. *Papilio glaucus*, L., a. *turnus*, L. Dr. Henry Skinner, of Philadelphia, took a perfect specimen of the melanic form named *fletcheri* by Kemp, at White River, Ont., on the Canadian Pacific Railway, where it was flying with scores of the ordinary form, around a damp spot below the platform.

14. *Papilio thoas*, L. Several specimens of this southern butterfly were taken in Ontario during the past season; Trenton, Sept. 21, (Evans); Sarnia, Oct. 9, (Dent); Niagara Glen, Sept. 3, (Williams).

16. *Papilio machaon*, L., a *aliaska*, Scudd. Mouth of Campbell Creek, Pelly River, Yukon, July 8, (Keele).

17. *Papilio bairdii*, Edw., a. *oregonia*, Edw. Peachland, B.C., July 27, (Wallis).

38. *Pontia napi*, L., b. *hulda*. Edw. Pelly River, July 13, (Keele).

42. *Synchloe creusa*, D. & H. Laggan, Mount St. Piran, near timber line, July 17, scarce, (Dod); Banff, (Sanson).

62. *Eurymus meadii*, Edw., a. *elis*, Strk. The commonest Colias on the head waters of the Athabasca River, (Mrs. Nicholl).

75. *Eurymus nastes*, Bdv. Near Taku River, Northern British Columbia, August 8, 1906, (Bryant).

128. *Argynnis eurynome*, Edw. c. *artonis*, Edw. Duck Lake, Sask., July 22, (Fletcher).

143. *Brenthis alberta*, Edw. On mountains near the head waters of the Athabasca and Saskatchewan Rivers, fairly swarming in many places, end of July, (Mrs. Nicholl).

144. *Brenthis astarte*, D. & H. On mountains near the headwaters of the Athabasca and Saskatchewan Rivers, end of July (Mrs. Nicholl). Dr. Henry Skinner tells us that 2 specimens were also taken on Mount Athabasca (altitude 7,200 feet) by Mrs. C. Schaeffer, of Philadelphia.

Charidryas hanhami, Fletcher. Treesbank, Man., July 15, several specimens, (Criddle, Fletcher, Skinner).

169. *Cinclidia harrisii*, Scud. Blackburn, Ont., June 28, July 5, (Young) Go Home, Ont. (Walker).

218. *Aglais milberti*, Godt. Scotch Lake, N.B. This species has been observed here since the beginning of October. It is one of the rarest butterflies in this section. (W. H. Moore).

270. *Erebia disa,* Thun., a. *mancinus,* D. & H. Headwaters of Saskatchewan, end of July, (Mrs. Nicholl).

291. *Œneis chryxus,* D. & H., a. *calais,* Scudd. Go Home Bay, Ont., June 16, (Walker). This interesting insect is very little known. The specimens described by Scudder were collected by Drexel from near Rupert House at the south-eastern extremity of Hudson Bay. It has also been taken at Carbonear, Newfoundland. Scudder says "it appears to be confined to the high northern regions of the eastern half of the continent." Its nearest ally is *Œ. chryxus,* a common insect in the main chain of the Rockies.

295. *Œneis norna,* Thun., k. *brucei,* Edw. Banff, Alta., on Sulphur mountain, (Sanson), occuring at from 7,500 to 8,500 feet altitude. Common on all the high mountains at head of Athabasca and Saskatchewan rivers, flying with *beanii,* end of July, (Mrs. Nicholl).

1. *beanii,* Elwes. Banff, on Sulphur mountain at a height of from 7,500 to 8,500 feet. Mount Stephen and Mount Field, B.C., about 7,000 feet, July 7 and 8. I also saw it on a mountain about 12 miles east of Lake Windermere on July 13. About 10 specimens at Mount St. Piran, Laggan, July 16-18, including a female on the summit at about 8,600 feet and another close above Lake Agnes, below timber line, at about 6,800 feet. (Dod.). Summit of Mt. St. Piran, August 4, (Fletcher).

335. *Uranotes melinus* Hbn. Digby, N.S., July 20, (Russell); Peachland, B.C., (Wallis).

383. *Erora læta,* Edw. Meach Lake, Que., June 14, 15, (Young).

409. *Cupido sæpiolus,* Bdv. Female seen ovipositing on the young flower buds of *Hedysarum boreale* at Kinistino, Alta., July 25, (Fletcher).

437. *Rusticus anna,* Edw. Pelly River, below Hoole River, July 5, (Keele).

469. *Pamphila palæmon,* Pallas. Eastman's Springs, Ont., near Ottawa, June 19, several specimens, (Gibson & Young). Only taken once before in the Ottawa district.

488. *Erynnis sassacus,* Harr. Nepigon, July 9, (Fletcher & Skinner); Go Home Bay, Ont., (Walker).

526. *Polites peckius,* Kirby. Banff, July 27, (Sanson).

584. *Epargyreus tityrus,* Fab. Cartwright, Man., June 2, one specimen, a new record for Manitoba, (Heath).

HETEROCERA.

677. *Pholus vitis,* L. McNab's Island, Halifax, N.S., Aug. 29, (Perrin). An immigrant from the South, Mr. Perrin says that his specimen answers well to the figure of *P. fasciatus* as shown on Plate 3 of Holland's Moth Book.

683. *Ampelophaga versicolor,* Harr. Ottawa, August 18, (Baldwin), Montreal, July, specimen taken at Lafontaine Park, collector unknown. record sent by Mr. Winn. The larvæ feed on *Nesæa verticillata* and should be looked for in August.

704. *Sphinx luscitiosa,* Clemens. Tukon River, branch of Megiskan River, July 20, (Wilson).

713. *Sphinx canadensis,* Bdv. Ottawa, July 6, (Baldwin); Quebec, July 3, (Boulton), Montreal, July, (E. C. Barwick).

778. *Basilona imperialis*, Dru. Kingston, Aug. 12, (Klugh). Larva found feeding on red and white pine in Simcoe County, Sept. 15, (Zavitz).

846. *Ecpantheria deflorata*, Fab. Niagara Glen, June 30, (Hahn).

861. *Phragmatobia assimilans*, Wlk., a. *franconica*, Slosson. Montmorency Falls, Que., June 14, and flying in bright sunshine at Lake Beauport, Que., June 23, (Boulton).

869. *Neoarctia yarrowi*, Stretch. Mount Stephen, Field, B.C., July 7, a fresh female at rest on a rock in hot sunshine, alt. 7,000 feet. I took a larva in first moult nearby, and bred a male on July 29, from a full fed larva found on a rock in hot sunshine on the top ridge of Mount Field, on July 8. This was of the ordinary woolly bear type with moderately long hairs, black mixed with dark red. The younger larvæ were less black, and refused all food offered. I also took a half grown larva high up on Mount St. Piran, Laggan, on July 17. All of these specimens were above timber line (Dod.)

874. *Apantesis virgo*, L., a. *citrinaria*, N. & D., Ottawa, Aug. 4, (Baldwin).

958. *Panthea portlandia*, Grt. A female on electric lamp, July 16, Field, B.C., (Dod).

960. *Panthea acronyctoides*, Walker. McNab's Island, Halifax, N.S., (Perrin).

982. *Apatela leporina*, L. Larvæ sent from North Head, N.B., Sept. 26, by Mr. M. R. Tuttle, and from Halifax, N.S., by Mr. C. H. Churchill. This is the first record we have of the species occurring in New Brunswick and Nova Scotia.

999. *Apatela radcliffei*, Harvey. Montreal about end of June, (Denny); Ottawa, mature larva found on apple, Sept. 26, (Létourneau).

1,008. *Apatela funeralis*, Grt. Montreal, June 4 and 21, July 15 and 27, (Denny); Ottawa, June 10, bred from maple, (Young).

1,012. *Apatela vinnula*, Grt. Digby, July 5, Aug. 9, (Russell); Ottawa, (Fletcher).

1,028. *Apatela retardata*, Wlk. St. John's, Que., July 1, (Chagnon); Ottawa, June 12, (Gibson), June 16, (Fletcher); Digby, June 26, (Russell).

1,046. *Apharetra dentata*. Grt. Digby, Aug. 29, (Russell).

1,078. *Hadenella minuscula*, Morr. Digby, Aug. 3, 1906, Sept. 14, 19, 1907, (Russell). In Dr. Smith's list this species appears as *Hadena minuscula*.

1,146. *Hillia algens*, Grt. Hymers, August, (Dawson); Montreal, (Winn).

1,149. *Hadena bridghami*, G. & R., Digby, Aug. 29, Sept. 12, (Russell).

Hadena ferens, Sm. Windermere, B.C., 3 specimens at light, July 11, 12, (Dod). New to British Columbia.

Hadena alberta, Sm. Calgary, a few at light, July 11 to Aug. 18, (Hudson).

Hadena miniota, Sm. Cartwright, one specimen Aug. 22, (Heath).

Hadena enigra, Sm. Calgary, one at light, July 11, (Hudson).

Hadena maida, Dyar. Kalso, Aug. 7 (Cockle); Glacier, B.C., (Mrs. Nicholl, *fide* Hampson, Cat. VI, p. 344).

1,221. *Hadena apamiformis*, Gn. St. Hilaire, Que., July, (Chagnon).

1,252.1. *Hadena semilunata*, Grt. Gleichen, Alta., one on flowers of Western Snowberry, July 22. I have not seen this for years. (Dod.)

1,279. *Hyppa indistincta*, Sm. Laggan, a female at light, July 18. "Agrees with the figure and description. I have the same species from Kalso and consider it distinct from *brunneicrista*." (Dod.).

1,302. *Laphygma frugiperda*, S. & A., and var. a. *obscura*, Riley. Both common at sugar and light throughout September, at Montreal, (Winn & Denny).

1,341. *Oncocnemis atrifasciata*, Morr. Truro, N.S., (DeWolfe).

1,347. *Oncocnemis major*, Grt. Aweme, July 13, (Fletcher).

1,353. *Oncocnemis pudorata*, Sm. Lake Agnes, Laggan, Alta., Hope Pass, B.C., (Mrs. Nicholl, *fide* Hampson, Cat. VI, p. 154).

1,360. *Oncocnemis regina*, Sm. Pile of Bones hill, 6 miles north of Regina, Aug. 10, 1886, (Fletcher). See Hampson, Cat. VI, Pl. XCIX., fig. 15.

1,429. *Semiophora youngii*, Sm. Digby, Aug. 9, (Russell).

1,533. *Rhizagrotis lagena*, Grt. Red Deer River, near Gleichen, a few at sugar, July 23 and 24, (Dod).

1,579. *Paragrotis plagigera*, Morr. Calgary, July 30 and Aug. 24, at light, (Dod and Hudson). Not seen for years. This species is erroneously recorded as *olivalis* in my Calgary list. (Dod.)

1,584. *Paragrotis pugionis*, Sm. Calgary, Sept. 7, (Dod.); Aweme, July 13, (Criddle and Fletcher); Beulah, Man., (Dennis); High River, Alta., (Baird).

1,599. *Paragrotis fumalis*, Grt. Rostrevor, Lake Rosseau, Sept. 3. (Gibson).

1,630. *Paragrotis vulpina*, Sm. Calgary, Sept. 23, (Dod).

1,695. *Paragrotis tristicula*, Morr. Windermere, B.C., July 12, at light, (Dod.) New to B.C.; Truro, N.S., (De Wolfe). A totally unexpected locality for this species. (J. B. S.)

1,725. *Paragrotis infusa*, Sm. Calgary, Sept. 2, (Dod). New to Alberta.

Paragrotis criddlei, Sm. Aweme, Aug. 24, '06, (Criddle).

Paragrotis cocklei, Sm. Kaslo, July 27, '04 (Cockle); Peachland, B.C., July 7, (Wallis).

1,732. *Paragrotis nordica*, Sm. Redvers, Sask., Aug. 3, '06 (A. J. Crocker, through A. F. Winn).

1,775. *Mamestra purpurissata*, Grt. var. *crydina*, Dyar. Windermere, B. C., July 10, one specimen. This agrees with specimens from Kaslo, the type locality. Dr. Smith claims that it is clearly a distinct species. (Jour. N.Y. Ent. Soc. XV, 152, Sept. 1907.) (Dod.)

1,825. *Mamestra goodelli*, Grt. St. Hilaire, Aug. 5, (Chagnon). A northern or mountain species, (J. B. S.).

1,840. *Mamestra sutrina*, Grt. Victoria, Aug. 29, (Anderson); Laggan, B.C., July 16, (Dod). Field, B.C., June 6, (Mrs. Nicholl).

Mamestra artesta, Sm. High River, (Baird).

1,890. *Morrisonia confusa*, Hub. Montreal, June 4, (Denny).

1,905. *Xylomiges tabulata*, Grt. Montreal, 1906, (Denny).

1,998. *Orthodes vecors*, Gn. St. Hilaire, Que., July 10, (Chagnon).

2,111. *Xylina thaxteri*, Grt. Truro, Sept. 18. (De Wolfe).

2,120. *Calocampa cineritia*, Grt. Truro, (De Wolfe); Montreal, (Denny); Ottawa, Oct. 17, (Young).

Cucullia indicta, Sm. Calgary, (Dod, *fide* Hampson, VI., p. 70).

2,138. *Copicucullia antipoda*, Strck. Penticton, B. C., (Mrs. Nicholl, *fide* Hampson, VI. p. 11.).

2,152. *Nonagria oblonga*, Grt. Trenton, June 24, (Evans).

2,165. *Gortyna immanis*, Gn. Ottawa, Sept. 14, (Fletcher); Rostrevor Muskoka, Ont., Sept. 8, (Gibson).

2,167. *Gortyna obliqua*, Harvey. Aweme, Aug. 28, (Criddle).

2,171. *Papaipema cerina*, Grt. Aweme, at light, one splendid specimen, Oct. 1, (Criddle).

2,175. *Papaipema harrisii*, Grt. Hymers, larvæ found in stems of *Heracleum lanatum*, imago 2 Sept., (Dawson); Aweme, reared from same food plant, Aug. 23, (Criddle).

Papaipema pterisii, Bird. Last year we recorded under the name of *Papaipema harrisii*, Grt., var., some Ottawa specimens reared from *Pteris aquilina*. Mr. Bird now informs us that this is not a variety of *harrisii* but a new species which he has described under the above name.

Papaipema œrata, Lyman, (not *P. nelita*, Strck.). Bred again for the fourth time from burdock, in the type locality, Montreal, (Lyman).

Papaipema eupatorii, Lyman. Montreal, one specimen bred from *Eupatorium purpureum*, (Lyman).

2,221. *Orthosia ralla*, Montreal, Aug. 24, (Chagnon).

2,288. *Nycterophæta luna*, Morr. Red Deer River, near Gleichen. Three specimens on thistle heads, July 24-26: two asleep after a rain storm, (Dod); Rudy, Sask., July 19, (Willing).

2,361. *Schinia marginata*, Haw. Ottawa, Aug. 25, (Gibson). A new record for the Ottawa district.

2,389. *Dasyspoudæa lucens*, Morr. Aweme, June 21, (Criddle). This is the first Canadian record of this beautiful little moth, which belongs to the Coloradan fauna.

2,395. *Melanoporphyria immortua*, Grt. Redvers, Sask., June 9, 1906, (A.Y. Crocker); Aweme, Man., June 21, (Criddle).

2,406. *Melicleptria sueta*, Grt. Vernon, (Venables).

2,420. *Heliaca diminutiva*, Grt. Red Deer River, near Gleichen, July 25 and 26, not common, (Dod).

2,423. *Heliaca nexilis*, Morr. Laggan, Mt. St. Piran, at about 7,000 feet, not rare, July 16-18, (Dod). Wilson Pass, near head of Saskatchewan River, July 22, (Mrs. Nicholl); Banff, (Fletcher, Sanson).

2,472. *Polychrysia moneta*, Fab., a. *esmeralda*, Oberthur. Calgary, July 30 and Aug. 13, (Dod).

2,528. *Autographa Sackeni*, Grote. Brazeau Creek, Rockies, Aug. 3, one specimen, (Mrs. Nicholl).

2,477. *Autographa metallica*, Grt. Duncans, B.C., 2 specimens, (Hanham).

2,487. *Autographa rogationis*, Gn. Toronto, May 3, 1897, Ottawa, (Gibson).

2,504. *Autographa v-alba*, Ottol. Kalso, (Cockle). *Teste* Ottolengui.

2,524. *Autographa corrusca*, Strk. Duncans, occasional, on the wing, July, Aug. and Sept., (Hanham).

2,532. *Syngrapha parilis*, Hub. Mt. Saskatchewan (7,500 feet), July 27, rather common (Mrs. Nicholl). This is the species figured by Ottolengui as *parilis* but by Holland as *devergens*, (Dod).

2,535. *Syngrapha devergens*, Hub. Wilcox Pass, Rockies, Alta., July 26, (Mrs. Nicholl *per* Dod).

2,696. *Fruva tortricina*, Zell. Calgary, one at light, July 30, (Dod).

2,769. *Melipotis limbolaris*, Geyer. Digby, July 28, (Russell).

2,836. *Catocala luciana*, Hy. Edw. Cartwright, at sugar, Sept., (Heath).

2,846. *Catocala pura*, Hulst. Cartwright, at sugar, Sept. 10, (Heath).

2,893. *Catocala pretiosa*, Lint. Cartwright, Sept. 10, (Heath).

2,953. *Strenoloma lunilinea*, Grt. Granville Ferry, N.S., (Payne). First Canadian record.

2,983. *Ypsia undularis*, Dru., *a. æruginosa*, Gn. Digby, June 6, (Russell).

3,036. *Philometra metonalis*, Wlk. Windermere, B.C., July 10-12, not rare, new to B.C., (Dod).

3,063. *Lomanaltes eductalis*, Wlk. Digby, June 24, (Russell).

3,117. *Notodonta simplaria*, Graef. Aweme, July 4, Aug. 9, (Criddle).

3,140. *Heterocampa biundata*, Wlk. Truro, July 24, (De Wolfe).

3,142. *Heterocampa bilineata*, Pack. Aweme, June 17, (Criddle).

3,145. *Ianassa lignicolor*, Wlk. Quebec, Aug. 15, (Boulton).

3,353. *Eustroma nubilata*, Pack. Digby, N.S., (Russell). A western moth, which I am rather surprised to see from Nova Scotia. (G. W.T.)

3,387. *Hydriomena sordidata*, Fab., c. *quinquefasciata*, Pack. Skagway District, northern B.C., (White-Fraser & Smith).

3,395. *Hydriomena contracta*, Pack. Ottawa, Sept. 10, (Fletcher); Rostrevor, Muskoka, Sept. 15, (Gibson); Digby, Aug. 16, (Russell). [This name should be *H. contractata*, Pack. (G.W.T.)].

3,449. *Petrophora incursata*, Hbn. Field and Emerald Lake, B.C., July 2-7; Laggan, July 18, up to 6,500 feet, (Dod); Crown Mountain, Vancouver, July 9, (Harvey).

Petrophora fossaria, Taylor. Lake Agnes, Laggan, July 18, (Dod).

3,620. *Deilinea borealis*, Hulst. Banff, June 24, a pair, (Mrs. Nicholl).

3,734. *Cymatophora denticulodes*, Hulst. Calgary, one male at light, Aug. 3, (Dod).

3,743. *Anthelia taylorata*, Hulst. Vancouver, May 8, (Harvey).

3,873. *Nacophora quernaria*, S. & A. McNab's Island, Halifax, emerged March 23, (Perrin).

3,878. *Jubarella danbyi*, Hulst. Vancouver, one at light, April 13, (Sherman).

3,933. *Plagodis approximaria*, Dyar. Kalso, May 3, (Cockle).

3,954. *Euchlœna serrata*, Dru. Trenton, July 12, not taken here before, (Evans).

4,000. *Marmarea occidentalis*, Hulst.. Vancouver, July 1, (Harvey); Duncans, B.C., at light, July, a much larger species than *Azelina ancetaria*, flying a week or two earlier, (Hanham).

4,040. *Leucobrephos brephoides*, Wlk. Mentioned in previous records as *middendorfi;* see Dr. Smith's article, Can. Ent. Nov. 1907. Three specimens, Mayo River, Yukon Territory, April 16, 1907, (J. A. Davidson, through Mr. J. Keele). These were of a very dark form similar to two specimens taken by Dr. A. P. Low, on the portage at Grand Falls, Hamilton River, Labrador, May 12, 1894.

4,106. *Tortricidia testacea*, Pack. Duncans, three specimens at light, in July. Not previously reported from Vancouver Island, Hanham).

4,409. *Phlyctœnia acutella*, Wlk. Toronto, (Metcalfe); Ottawa, (Young).

4,514. *Pyralis costiferalis*, Wlk. Trenton, one specimen, July 22, (Evans).

4,583. *Crambus myellus*, Hbn. Vernon, (Venables).

4,977. *Pterophorus kellicottii*, Fish. Ottawa, (Young).

Exartema merrickanum, Kearf. Rouville, Que., July 5, (Chagnon); Ottawa, (Young).

5,033. *Olethreutes capreana*, Hbn. Sudbury, (Evans).

Olethreutes wellingtoneana, Kearf. Wellington, B.C., May 19, (Taylor).

Olethreutes removana, Kearf. Aweme, Aug. 16, (Criddle).

Olethreutes provana, Kearf. Wellington, April, (Taylor).

Olethreutes galaxana, Kearf. Vernon, April 13—May 13, (Venables).

Olethreutes glitranana, Kearf. Aweme, June 29, (Criddle); Regina, July 2, (Willing); Winnipeg, (Hanham).
Olethreutes coronana, Kearf. Aweme, July 9, (Criddle); Beulah, Man., Aug. 15, (A. J. Dennis).
Eucosma fuscana, Kearf. Rounthwaite, Man., July, (L. E. Marmont).
Eucosma tomonana, Kearf. Westmount, Que., (Winn).
Eucosma johnsonana, Kearf. Victoria, (Taylor).
Eucosma hohana, Kearf. Mount St. Piran, Alta., Aug. 17, (Dr. W. Barnes).
Eucosma heathiana, Kearf. Cartwright, (Heath).
Eucosma solandriana, Hbn. Montreal, June 22, (Winn); Ottawa, (Young).
Eucosma madderana, Kearf. Rounthwaite, July (Marmont); Regina, (Willing).
Thiodia awemeana, Kearf. Aweme, May 20 to June 29, (Criddle); Beulah, (Dennis).
Thiodia asphodelana, Kearf. Calgary, head of Pine Creek, July 2, (Dod).
5,200. *Thiodia montanana*, Wlsm. Aweme, Aug. 25, (Fletcher).
Thiodia timidella, Clem. Montreal, June 9, (Chagnon).
Proteopteryx marmontana, Kearf. Rounthwaite, June 11, (Marmont); Aweme, July 12-24, (Criddle); Prince Albert, Sask., July 19, (Criddle); Regina, July 15, (Fletcher).
Proteopteryx criddleana, Kearf. Aweme, July 24, Aug. 13, (Criddle); Rounthwaite, July, (Marmont).
Proteoteras torontana, Kearf. Toronto, June 5, (Gibson).
Epinotia watchungana, Kearf. Aylmer, Que., June 8, (Gibson);
Epinotia plumbolineana, Kearf. Wellington, June, (Taylor and Bryant).
Epinotia normanana, Kearf. Aweme, June 27, (Criddle).
Enarmonia prosperana, Kearf. Vernon, (Venables).
Enarmonia vancouverana, Kearf. Wellington, June, (Bryant).
Enarmonia youngana, Kearf. Ottawa, (Young).
Enarmonia cockleana, Kearf. Ottawa, (Young).
Enarmonia saundersana, Kearf. Toronto, May 24, to June 11, (Saunders).
5,276. *Enarmonia americana*, Wlsm. Ottawa, June 11, (Gibson).
5,314. *Acleris nivisellana*, Wlsm. Rostrevor, Muskoka, Sept. 7, (Gibson).
Epagoge lycopodiana, Kearf. Ottawa, (Young).
5,353. *Sparganothis flavibasana*, Fern. Ottawa, larvæ common on cultivated Honeysuckle (*Lonicera Japonica*), June 19, moths emerged July 2 to 6, (Kearfott and Gibson).
Hysterosia tiscana, Kearf. St. Hilaire, July 7, (Winn).
Hysterosia cartwrightiana, Kearf. Cartwright, (Heath).
Carposina ottawana, Kearf. Ottawa, (Young).
Kearfottia albifasciella, Fern. Ottawa, (Young).
5,524. *Choreutis silphiella*, Grt. Vernon, (Venables).
Recurvaria gibsonella, Kearf. Ottawa and Hull, Que., moths emerged June 29 to July 6, (Gibson).
Recurvaria coniferella, Kearf. Ottawa, June 20, (Gibson).
Trichotaphe levisella, Fyles. Levis, Que., (Fyles).
Gelechia fondella, Busck. Aweme, May 30 to June 20, (Criddle); Beulah, (Dennis), Rounthwaite, (Marmont).

5,834. *Stenoma schlægeri*, Zell. Truro, July 17, (De Wolfe).
5,876. *Depressaria sabulella*, Wlsm. Ottawa, in house, April 16, (Gibson).
5,879. *Depressaria lythrella*, Wlsm. Rostrevor, Muskoka, Sept. 7, (Gibson).
Mompha claudella, Kearf. Rounthwaite, July 11, (Marmont).
6,265. *Lithocolletis ostensackenella*, Fitch. Trenton, May 11, (Evans).
Incurvaria taylorella, Kearf. Wellington, (Taylor).
Monopis monachella, Hbn. Aweme, Aug. 25, (Fletcher); St. Hilaire, July 7, (Winn); Rouville, Que., July 5, (Chagnon).
6,531. *Tinea arcella*, Fab. Montreal, June 21, (Winn).

COLEOPTERA.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico.)

30*a*. *Cicindela limbata*, Say. Rudy, July 19; Radisson, Sask., July 29, (Fletcher, Willing, Skinner).
35. *Cicindela hirticollis*, Say. Rudy, Sask., July 19, (Fletcher).
35. *Cicindela cinctipennis*, Lec. Running on high dry prairie among the grass, Rudy, July 19, (Willing).
116. *Carabus mœander*, Fisch. Kinloss, Ont., July 16, '98, (per W. Brodie).
188. *Nebria metallica*, Fisch, var. Metlakatla, B.C., (Keen).
645. *Amara fulvipes*, Putz. One specimen from Glen Ross, Hastings Co., May 10, 1902, not previously recorded from Canada, (Evans).
728. *Dicœlus teter*, Bon. North Bruce Co., Ont., (per W. Brodie).
788. *Platynus tenuis*, Lec. Trenton, June, 19, Aug. 11, never taken here before, (Evans).
803. *Platynus ferreus*, Hald. North Bruce Co., (per W. Brodie).
1,057. *Piosoma setosum*, Lec. Rudy, July 20, (Fletcher).
1,477. *Hydaticus stagnalis*, Fab. Ottawa in moss (Dr. H. M. Ami). Mr. Harrington has only twice found the species.
1,487. *Dytiscus circumcinctus*, Ahr. Reference was made in last year's *Entomological Record* to large numbers of this beetle having been taken at electric lights in Winnipeg during the month of October. On Oct. 4 of the present year, Mr. Evans again collected in Winnipeg, over one hundred specimens in the same manner, and about the same time, Mr. T. N. Willing records that enormous numbers of the same species appeared in Regina when his two boys collected for him a pickle jar full and then stopped.
1,791. *Cyrtusa blandissima*, Lec. Aweme, Man., June and July; burrowing in the sand in company with *Ochodæus simplex* and *Bolboceras lazarus*. Found in the burrows made by the larger species, (Criddle).
1,881. *Tychus cognatus*, Lec. Metlakatla, (Keen).
Batrisus zepharinus, Casey. Metlakatla, (Keen).
3,062. *Coccinella tricuspis*, Kirby. Peachland, B.C., (Wallis).
3,095*a*. *Brachyacantha albifrons*, Say. Aweme July 11, (Criddle).
3,148. *Scymnus collaris*, Melsh. Aweme, July 14, (Criddle).
3,734. *Pocadius helvolus*, Er. Reared from a *Lycoperdon*, Grand Forks, B.C., Aug., 1904, (Fletcher).
4,093. *Alaus oculatus*, L. Vernon, July 8, (Wilmot).
4,369. *Limonius subauratus*, Lec. Vancouver, May 4, (Harvey).
4,382. *Pityobius anguinus*, Lec. Granville Ferry, N.S., (Payne).

4,589. *Dicerca pectorosa*, Lec. Kaslo, June 25, (Cockle).

4,594. *Pœcilonota cyanipes*, Say, Radisson, July 29, on *Populus tremuloides* and *P. balsamifera*, common, (Fletcher, Willing, Skinner).

4,600. *Buprestis confluens*, Say. Makinak, Man., (per G. Chagnon); Aweme, July 16, Aug. 9, rare, (Criddle).

4,729. *Agrilus granulatus*, Say. Makinak, Man., (per G. Chagnon).

4,779. *Celetes basalis*, Lec. Aweme, July 5 and 9, rare, (Criddle).

4,913. *Silis spinigera*, Lec. Kaslo, June 2, (Cockle).

5,027. *Malachius thevenetii*, Horn. Kaslo, June 5, (Cockle).

5,110. *Dolichosoma foveicolle*, Kirby. Aweme, July 9, (Criddle).

5,380. *Priacma serrata*, Lec. Kaslo, May 15, (Cockle). Mr. Cockle took a fine pair of this rare beetle at Kaslo. We know of no other Canadian captures. It was described by Dr. J. L. Leconte in 1861 from "East of Fort Colville at Sinyak Water depot and at Camp Kootenay." Dr. Leconte notes the variation in the size of this remarkable species, length .43 to .82 inch.

5,579. *Ochodæus simplex*, Lec. Aweme, burrowing in sand, July 4-13, (Criddle).

5,591. *Bolboceras lazarus*, Fab. Aweme, July 19, (Criddle).

5,594. *Odontæus obesus*, Lec. Aweme, Sept. 2 and 7, in hole in ground, (Criddle); Rudy, July 19, (Henry Skinner).

5,822. *Polyphylla decemlineata*, Say. Rudy, July 19, (Willing).

5,948. *Spondylis upiformis*, Mann. North Bruce County, May 17, '87, (per W. Brodie); Bear Canyon, B.C., May 30, '85, (per W. Brodie); Banff, (Sanson).

5,986. *Gonocallus collaris*, Kirby. Illecillewaet, B.C., May 1, '85, (per W. Brodie).

6,049 *Romaleum simplicicolle*, Hald. Port Sydney, Ont., August, 1890, (Brodie).

6,181. *Xylotrechus quadrimaculatus*, Hald. Ridgeway, Ont., July 28, emerging from branches of Sugar Maple, (Zavitz); Ste. Croix, Que., (Bédard).

6,222. *Desmocerus auripennis* Chev. Glacier, B.C., Aug. 26, (Fletcher).

6,233. *Centrodera decolorata*, Harr. Port Sydney, August, (Brodie).

6,248. *Pachyta liturata*, Kirby. Sulphur Mountain, Banff, Alta., July 30, a black variety, (Sanson).

6,268. *Acmæops vincta*, Lec. Kaslo, May 14, (Cockle).

6,398. *Goes debilis*, Lec. North Bay, June 3, (Brodie).

6,478. *Saperda calcarata*, Say. Peachland, B.C. July, (Wallis).

6,480. *Saperda candida*, Fab. Scotch Lake, N.B., (W.H. Moore); St. John, N.B., (J. Gordon Leavitt). This beetle seems to be very much rarer in the Maritime Provinces than it is in Ontario and Quebec.

6,514. *Tetraopes quinquemaculatus*, Hald. Aweme, July 25, (Criddle).

6,523. *Donacia pubicollis*, Suffr. Qu'Appelle Lakes, July, (Halkett).

6,628*a*. *Cryptocephalus ornatus*, Fab. Aweme, July 10, (Criddle).

6,628*c*. *Cryptocephalus cinctipennis*, Rand. Aweme, July 17, (Criddle).

6,742. *Chrysochus cobaltinus*, Lec. Nelson, B.C., August 19, abundant on *Apocynum androsæmifolium*, (Fitzroy Kelly).

6,781. *Entomoscelis adonidis*, Fab. Near Sixty-one mile River (141 Meridian), Yukon, (T. P. Reilly). The farthest record north we have of the species.

6,795. *Chrysomela exclamationis*, Fab. Aweme, Sept. 6, (Criddle).

6,810. *Chrysomela multipunctata*, Say. This fine species was extremely abundant on willows along the Saskatchewan River at Rudy on July 19, (Fletcher and Willing).

6,827. *Plagiodera oviformis*, Lec. Aweme, June 20, (Criddle).

7,396. *Cœlocnemis dilaticollis*, Mann. Vernon, under logs, June, (Venables); Banff, (Sanson); Peachland, (Wallis).

7,994. *Dendroides canadensis*, Lat. Trenton, June 17 to Aug. 8, five specimens. I have not taken this species for many years, (Evans). Two specimens were brought back from the Skagway District in Northern British Columbia, by G. White-Fraser and R. Smith.

8,134. *Cantharis viridana*, Lec. Rudy, July 20, (Fletcher).

8,271. *Amnesia ursina*, Horn. On raspberries, destructive to the buds, Vernon, B.C., (Venables); Victoria B.C. (Taylor).

8,331. *Evotus naso*, Lec. Rudy, on willows, July 20, (Fletcher); Kelowna, B.C., on apple, (F. J. Watson).

8,427. *Phytonomus punctatus*, Fab. Harrison, B.C., August, (Wilmot). The Clover Leaf Weevil was found on Vancouver Island for the first time in 1902, by Mr. Hanham. Mr. Wilmot's record shows that it has now worked its way up the Fraser valley as far as Harrison.

8,482. *Hypomolyx pineti*, Fab. Skagway District of Northern British Columbia, (White-Fraser and Smith).

8,498. *Lixus concavus*, Say. Ottawa, September, three specimens found on *Polygonum pennsylvanicum*, (Young). This is the Rhubarb Weevil which in some parts of the United States has sometimes given trouble, but is rare in Canada. This is the first time the species has been recorded from the Ottawa District.

8,607. *Otidocephalus chevrolatii*, Horn. Meach Lake, Aug. 1, (Young).

8,676. *Orchestes rufipes*, Lec. This rare little weevil was very abundant and destructive to willows at Ottawa in Sept., the larvæ mining in the leaves and the mature beetles eating out the surface in a similar way to flea-beetles, (Fletcher).

9,667. *Amblopusa brevipes*, Casey, var. Metlakatla, (Keen).

10,767. *Nocheles vestitus*, Casey. Kelowna, injuring buds of Apple, May, 1892, (F. J. Watson).

Nocheles torpidus, Lec. New Denver, B.C., June 14, (W. D. Mitchell); Grand Forks, B.C., June 6, (M. Miller).

HYMENOPTERA.

Work among the hymenoptera seems to have lagged behind a good deal during the last three years. This is much to be regretted, owing to the great importance of these insects. Moreover, the difficulty in separating the genera and species is sometimes so great that it alone should serve as a stimulus to those who are looking for a specialty in which they may do good work. A few records have been received, which it is well to include here. A collection of *Bombi* has been sent to Mr. H. J. Franklin, of Amherst, Mass., who is making a specialty of these insects, and who has kindly furnished the names of a few of the more interesting which are here given as a beginning. It is to be hoped that these will be largely added to in succeeding years. The wasps and bees present excellent fields for special work.

Zaræa inflata, Nort. Trenton, reared from larvæ feeding upon a shrub in my garden last year; more larvæ were found this year, (Evans).

Labidia opinus, Cress. Kaslo, Aug. 11, (Cockle).

Pamphilius ruficeps, Hargtn. Toronto, July 30, '88, (Metcalfe); Ottawa, May 31, (Harrington); Maisonneuve, near Montreal, Que., (Albert). This handsome sawfly seems to be rare. Another specimen was taken in Montreal some years ago by Rev. C. J. Ouellet.

Oryssus occidentalis, Cress. Peachland, B.C., July, (Wallis).

Diastrophus cuscutæformis, O.S. Guelph, in galls on stems of *Rubus villosus*, (Jarvis).

Diastrophus potentillæ, Bass. Perth, in round galls on stems of *Potentilla canadensis*, (Jarvis). Youghall, N.B., July, (Fletcher).

Diastrophus turgidus, Bass. Guelph, on stems of *Rubus strigosus*, (Jarvis).

Andricus punctatus, Bass. Guelph, on stem of *Quercus coccinea*, (Jarvis).

Andricus seminator, *Harr.* London, Ont., from galls on *Quercus alba*, (J. Dearness).

Andricus topiarius, Ashm. Guelph, leaf galls of *Quercus macrocarpa*, (Jarvis).

Biorhiza forticornis, Walsh. Gravenhurst, Ont., galls on *Quercus alba*, (Jarvis); very abundant on young shoots of *Quercus macrocarpa*, Rivers, Man., (Fletcher).

Pristaulacus melleus, Cress. Kaslo, June 3-30, (Cockle).

Ichneumon caliginosus, Cress. Kaslo, bred from pupa of *Grapta satyrus* found at Montezuma mine, South fork of Kaslo Creek, B.C., emerged Sept. 7, (Fletcher). Mr. Harrington has taken several specimens of this widely distributed species at Ottawa.

Ichneumon milvus, Cress. Ottawa, Aug. 22, (Harrington). Meach Lake, Sept. 1, (Fletcher). One of our rarest ichneumons.

Trogus brullei, Cress. Maisonneuve, near Montreal, (Albert).

Trogus fulvipes, Cress. Kaslo, ex pupa of *Papilio eurymedon*, May, (Cockle); ex pupa of *P. turnus*, Digby, Oct. 2, (Russell); Aweme, July 14, (Fletcher).

Trogus fletcheri, Hargtn. Bred from pupa of *Papilio eurymedon*, Wellington, B.C., (Taylor).

Cryptus proximus, Cress. Kaslo, May, (Cockle).

Ephialtes occidentalis, Cress. Kaslo, July 20, (Cockle).

Ephialtes variatipes, Prov. Kaslo, July 4, (Cockle); Ottawa, (J. A. Guignard).

Rhyssa persuasoria, L. Millie Lake, near height of land, Hudson Bay Slope, July 26, (Wilson).

Thalessa nortoni, Cress. Hymers, (Dawson). Metlakatla, B.C., (Keen).

Lampronota marginata, Prov. Levis, Que., reared from *Trichotaphe levisella*, (Fyles).

Spilochalcis (Chalcis) *encausta*, Cress. Aweme, three specimens of this beautiful and grotesque little insect were taken by Mr. Evelyn Criddle, July 17.

Masaris marginalis, Cress. Kaslo, June 2, (Cockle). This is the first specimen of this genus to be recorded from Canada. It is a slender wasp-like insect but has clubbed antennæ.

Bombus borealis, Kirby. Nepigon, Ont., July 1, '88, Ottawa, Aug. 27, '02, (Fletcher).

Bombus californicus, Smith. Prince Albert, July 6, 1900, an extreme variation; Calgary, July 17, nearly typical, (Fletcher).

Bombus fervidus, Fab. McLeod, Alta., June 20, (Fletcher).

Bombus huntii, Greene. McLeod, June 20, (Fletcher).

Bombus impatiens, Cress. Ottawa, Oct. 2, '02, (Fletcher).

Bombus kirbyellus, Curtis. Fullerton, Hudson Bay, July, 1904, (Halkett); Mount Edith, Banff, July 7, '02, (Fletcher.)
Bombus melanopygus, Mylander. Mount Edith, Banff, July 7, '02, (Fletcher).
Bombus nevadensis, Cress. Vernon, June, (Venables); McLeod, Alta., June 20, '02, (Fletcher and Willing); High River, Alta., a magnificent melanic specimen, the whole body uniformly black, (Baird).
Bombus occidentalis, Greene. Banff. Aug. 28, (Sanson).
Bombus pennsylvanicus, De Geer. Ottawa, (Fletcher).
Bombus perplexus, Meach Lake, July 20, '05, (Gibson).
Bombus sylvicola, Kirby. Fullerton, June 20, '04, (Halkett).
Bombus ternarius, Say. Prince Albert, July 6, '00, (Fletcher).
Bombus terricola, Kirby. Kebinakagami River, near height of land, Hudson Bay slope, Aug. 2, '03, (Wilson).
Bombus vagans, Smith. Nepigon, July 1, '88.; Ottawa, Aug. 25, May 5, (Fletcher).
Psithyrus interruptus, Greene. Mount Edith, Banff, July 7, '02, (Fletcher).
Psithyrus laboriosus, Fab. Ottawa, April 26, 01, (Fletcher).

HEMIPTERA.

Several additions have been made during the past summer to the collections of Canadian hemiptera, most of them to the sub-order homoptera. Unfortunately, few of the records have been sent in with sufficient data to warrant their inclusion here. Useful notes on these insects, as with all others, give the date of capture, the locality, and, when possible, the nature of the food. The following list from Mr. J. D. Evans, of Trenton, is the most complete and is submitted because many of the insects mentioned are new to the Canadian list. Mr. Van Duzee, who kindly identified the material, considers their capture worthy of being put on record.

Helicoptera septentrionalis, Prov. Sudbury, June 6.
Helicoptera opaca, Say. Co. Hastings.
Heliria strombergi, Godg. Sudbury, Aug. 8, 1889.
Cyrtolobus discoidalis, Emm. Belleville.
Cyrtolobus trilineatus, Say. Belleville.
Telamona Westcotti, Godg. Belleville.
Telamona decorata, Ball. Belleville.
Telamona compacta, Ball. Halifax, N. S., June, 1897.
Scaphoideus lobatus, Van D. Trenton, Sept. 3, '01.
Athysanus osborni, Van D. Trenton, Aug. 15, '01.
Thamnotettix belli, Uhler. Trenton, June 6, '01.
Xestocephalus fulvocapitatus, Van D. Trenton, Aug. 29, '01.
Aphrophora Signoreti, Fitch. Co. Hastings.
Gypona cinera, Uhler. N.W. Terr.
Pediopsis canadensis, Van D. Co. Hastings, June 27, '03.
Bythoscopus sobrius, Walker. Sudbury, 1892.

Mr. T. D. Jarvis, of Guelph, in connection with his studies of vegetable galls and scale insects has found the following species, which are of interest from the localities where found.

Pseudococcus trifolii, Forbes. On roots of white clover at Collingwood.
Chionaspis salicis, L. Guelph, on leatherwood (*Dirca palustris*).

Aspidiotus æsculi, Johnson. On basswood (*Tilia americana*), Toronto, Brantford, Guelph.

Aspidiotus diffinis, Newst. Guilds, Ont., on *Tilia americana.*

Aspidiotus osborni, Newell & Ckll. Toronto, on *Quercus alba;* Guelph, on *Betula lutea.*

Aspidiotus ulmi, Johnson. On *Ulmus americana*, Guelph, Toronto.

Kermes pubescens, Bogue. On *Quercus alba*, Perth, Toronto, Guelph and Brantford.

Aleyrodes asarumis, Schimer. On *Asarum canadense*, Guelph and London.

Aleyrodes forbesi, Ashm. On *Acer saccharinun*, Guelph.

Mr. W. Metcalfe, of Ottawa, sends the following as the most interesting species he has added to his collection this year:

Ceresa constans, Walk. Hull, Que., very local, but abundant on three special basswood trees. A distinct and readily recognized species.

Pediopsis bifasciata, Van Duzee. Mer Bleue, Ottawa, an Aspen Poplar June. A good species distinct from *trimaculata*, Fitch.

Peltonotellus histrionicus, Stal. Mer Bleue, Ottawa, August. The rare macropterous form of this nearly always wingless species.

Clastoptera proteus, Fitch, subsp. *nigra*, Ball. Mer Bleue, Aug. New to the Ottawa district. (Metcalfe.)

Emesa longipes, DeG. Several specimens of this remarkable bug were found by Mr. W. A. Dent, at Sarnia, Ont., in the first week of October. These are the first specimens which we know of as having been found in Canada. It is an extremely slender species with very long slender legs, the anterior pair of which are modified for grasping. They are called Thread-legged Bugs and are predaceous in their habits. Superficially, they resemble minute walkingstick insects but can of course be seen to be different by their mouth parts and from having wings.

ORTHOPTERA.

Large collections of orthoptera have been made in various parts of Canada during the past two years and many interesting species have been taken. The lists are not as yet complete but some of the more interesting have already been reported on. Most of these specimens have been identified through the kindness of Dr. E. M. Walker, who has also himself collected assiduously. His discoveries have been of so much interest that he purposes at an early date to prepare special papers upon them for the *Canadian Entomologist.* The following captures are worthy of mention:

Mecostethus gracilis, Scudd. On swampy prairie, Radisson, Sask., July 29, (Fletcher).

Aulocara elliotii, Thom. Vernon, B.C., July 26, '95 (Fletcher). The first Canadian record.

Arphia teporata, Scudd. Banff, July 12, '02, (Sanson). New to Canada.

Arphia frigida, Scudd. Aweme, June 21, (Criddle); Radisson, July 29; Rudy, Sask. Red-winged, no yellow costal stripe, July 19, (Fletcher.)

Trimerotropis vinculata, Scudd. Ashcroft, B.C., June 5, (Rev. W. M. Roger). Victoria, (Taylor).

Trimerotropis agrestis, McNeill. Aweme, Aug. 14, (Criddle). New to Canada. This elegant little locust has been taken by the Messrs. Criddle on the sand hills near the Douglas swamp, Manitoba, for many years. In coloration it is exactly like the sand upon which it settles.

Melanoplus altitudinum, Scudd. Fort William, Ont., Aug. 27, Nepigon, Aug. 29. One of the females from Nepigon is a long-winged form. (Walker). New to Canada.

Melanoplus extremus, Walk. A few specimens of the short-winged form were taken in a floating cranberry bog at Go Home, Ont., July to August, 1907. It was common at Fort William where both forms were represented, (Walker); Beaver Lake, Alta., Long-winged, (Halkett).

Melanoplus validus, Scudd. Nelson, B.C., Sept. 30, 1906, (Prof. W. J. Alexander). New to Canada.

Amblycorypha oblongifolia, De G. A beautiful specimen of the pink form of this Katydid was exhibited by Dr. Bethune at the annual meeting of the Entomological Society of Ontario. It was collected at Colchester, South, in Essex Co., Ont., Sept. 30. This form is well shown in *Entomological News* for May, 1901. In *Science* for Nov. 8, 1907, is a note on Pink Katydids and other insects by Mr. J. A. Grossbeck.

Anabrus longipes, Caud. Nelson, Sept. 30, 1906, (Prof. Alexander). New to Canada.

Platycleis fletcheri, Caud. "Four males of this rare insect, hitherto only known by the single female from Calgary, were taken at Fort William. This was one of the dimorphic forms I found in this interesting locality and the only one of that nature known among the Decticinæ. The species is interesting as being of a European type; the genus is a common one in Europe, but is the only one of the *Decticinæ* represented in North America," (Walker); Millarville, Alta., Aug., 1906, 2 short winged males (Dod); Mr. Dod's specimens were taken at about 10 miles from where the type specimen was collected. Although recorded as from Calgary the specimen was actually taken between Midnapore and Millarville, and about 10 miles south of Calgary.

Pezotettix borealis, Scudd. Windy Lake, on C.P.R., near Sudbury, Ont., Oct. 4, three specimens on *Comptonia asplenifolia*, (Fletcher).

Asemoplus nudus, E. Walk. Banff, Alta., (Sanson).

Cyphoderris monstrosa, Uhl. Peachland, B.C., (Wallis). The only previous Canadian record for this rare and grotesque insect was Banff, Alta., where a few specimens have been taken by Mr. Sanson. During the past summer Mr. Wallis collected a pair at Peachland on Okanagan Lake, B.C.

ODONATA.

Owing to the encouragement given by Dr. E. M. Walker, of Toronto, several of our collectors have sent in specimens of dragonflies, many of which have already been examined by Dr. Walker. He has provided the following list of species which he considers of more than usual interest to Canadian entomologists:

Lestes disjunctus, Selys. Ottawa, (Létourneau). Metlakatla, Aug. 4, '04. Massett, Q.C.I., (Keen).

Lestes inæqualis, Walsh. Go Home Bay, Ont. One pair from cranberry bog on margin of small lake, July 3, (Walker). New to Canada.

Lestes unguicutalus, Hag. Ottawa, July 16, (Gibson, Létourneau).

Argia violacea, Hag. Hull and Meach Lake, Q., July 13, 21, (Gibson).

Ischnura verticalis, Say. Orange form, Hull, Q., July 17, (Létourneau), Pruinose black form, Hull, July 13, (Gibson).

Nehalennia gracilis, Morse. Go Home Bay. Abundant on sphagnum bogs on the margins of small lakes, (Walker). New to Canada.

Enallagma ebrium, Hag. Ottawa, June 7, July 2, (Gibson).

Enallagma calverti, Morse. Laggan, Alta., 1890, (T. E. Bean).

Enallagma cyathigerum, Charp. One male, Pittsburg Camp, Georgian Bay, June 21, (Walker). New to Ontario.

Enallagma minusculum, Morse. Scotch Lake, N.B., July 7, (W. H. Moore). New to Canada.

Gomphus fraternus, Say. Victoria Harbour, Georgian Bay, July, (A. G. Huntsman).

Boyeria grafiana, Williamson. Nagagami River, Hudson Bay slope, 15 miles up, (Wilson).

Boyeria vinosa, Say. Kenogami River, July 16, '04, (Wilson).

Æschna clepsydra, Say. Ottawa, July 8, (Gibson).

Æschna sitchensis, Hag. Levis, (Fyles). Burroughs Bay, Alaska, Aug. 5, 1894, (J. A. Cadenhead). A rare species recorded also from Newfoundland, *Ent. News*, Apl., 1906, p. 135, by Williamson.

Nasiæschna pentacantha, Rambur. One male, Go Home Bay, Ont., July 16. Also one half-grown nymph from the same locality and several full-grown ones from Bala, Ont., Aug. 28, 1906, (W. H. Fraser). New to Canada.

Didymops transversa, Say. Ottawa, July 14, '99, (Gibson).

Neurocordulia yamaskanensis, Prov. Go Home Bay. Nymphs and perfect insects. June 28 to July 23, (Walker). New to Ontario.

Cordulia shurtleffi, Scud. Nepigon, July 1, '88, (Fletcher). Go Home Bay, July, (Walker). Toronto, June 9, (W. J. Fraser).

Tetragoneuria cynosura semiaquea, Burm. Ottawa, May 31, '99, (Gibson).

Somatochlora forcipata, Scud. Rigaud, Que. (Rev. J. E. Desrochers). Also recorded from Newfoundland by Williamson.

Somatochlora minor, Calvert. Fort William, Ont. Aug. 26, (Walker). New to Canada.

Somatochlora albicincta, Burm. Nepigon, Aug. 30, (Walker). New to Ontario.

Nannothemis bella, Uhler. Go Home Bay. Abundant locally, on floating sphagnum bogs, June 28 to Aug. 1, (Walker).

Leucorhinia proxima, Calvert. Peachland, B.C., July 19, (Wallis).

Sympetrum scoticum, Don. Beaver Lake, Alta., Aug., (Halkett).

Sympetrum obtrusum, Hag. Peachland, July 19, (Wallis).

Libellula incesta, Hag. Go Home Bay, July 15, (Walker).

Libellula exusta, Say. Meach Lake, July 21, (Gibson).

Diptera.

(Arranged according to a Catalogue of North American Diptera by J. M. Aldrich. Smithsonian Misc. Coll. XLVI, No. 1,144. The numbers refer to the pages of the catalogue.)

Aëdes quaylei, D. and K. Nanoose Bay, Vancouver Island, B.C., Aug. 1, (Fletcher).

Aëdes spenceri, Theob. Regina, (Willing).

Culiseta inornatus, Will. Carnduff, Sask., (Willing).

138. *Pelorempis americana*, John. Vancouver, B.C., April 22, (Harvey).

153. *Lasioptera corni*, Felt. Guelph, Muskoka and London, (Jarvis).

155. *Dasyneura canadensis*, Felt. Ottawa, reared from the cones of White Spruce, (Fletcher).

Cecidomyia ulmi, Beuten. Guelph, from *Ulmus americana*, (Jarvis).

Hormomyia cratægifolia, Felt. Guelph, on leaves of *Cratægus*, (Jarvis).

169. *Simulium fulvum*, Coq. Lake Louise, Laggan, Aug. 3, (Skinner and Fletcher).

193. *Pangonia fera*, Will. Crown Mountain, Vancouver, B.C., one male, July 9, (R. S. Sherman).

206. *Tabanus phænops*, O.S. Vancouver, July, a male, (Sherman).

223. *Spogostylum melanopogon*, Big. Crown Mount, Vancouver, July 9, (Harvey). The only locality given in Prof. Aldrich's catalogue is "North America."

241. *Eclimus auratus*, Will. Vancouver, July 25, (Harvey).

272. *Laphria pubescens*, Will. Vancouver, July 25, (Harvey).

401. *Pocota grandis*, Will. Vancouver, July, (Sherman).

418. *Cuterebra frontinella*, Clark. Guelph, larva from neck of kitten, (Jarvis); Almonte, Ont. larva from chipmunk, *Tamias striatus*, (J. K. Darling). The fly emerged at Ottawa in June, (J. F.).

419. *Cuterebra grisea*, Coq. Aweme, (Criddle); Saskatoon, Sask., July 21, (Willing); Norden, Alta., July, (W. Dover).

423. *Alophora magnapennis*, Johnson. One specimen of this grand tachinid was taken at Ottawa by Mr. Harrington. The original type was collected at Montreal by Mr. G. Chagnon. It is easily recognized by its conspicuously large and boldly blotched wings.

449. *Belvosia bifasciata*, Fab. Tessier, Sask. July 20, (Fletcher).

647. *Agromyza æneiventris*, Fallen. Guelph and Muskoka district, on stems of *Populus tremuloides*, (Jarvis).

648. *Agromyza magnicornis*, Loew. Guelph, on leaves of *Iris versicolor*, (Jarvis).

INDEX.

Page.
Agrilus ruficollis ....(figs.) 97
Agromyza Galls 85
Amelanchier, Gall on 92
Amphibolips inanis 90
Andricus Galls 89, 90, 91
Aphids, Spraying to kill 80
Apple Maggot 95
Argyresthia, Busck's Revision of ... 114
Aspen, Gall on 85
Asphondylia Gall 87
Aspidiotus ancylus ....(fig.) 62
" Forbesi ....(figs.) 59
" juglans-regiæ ....(figs.) 61
" Osborni 63
" ostreæformis ....(figs.) 57
" perniciosus ....(figs.) 52
Aulacaspis rosæ 71

Balkwill, J. A., article by 26
Balsam Fir Needle Gall 86
Basiæschna janata 47
Bees and the Yield of Fruit 21
Bethune, C. J. S., articles by 95, 99
Biorhiza forticornis 90
Bittacomorpha clavipes ....(fig.) 108
Blackberry Galls 88, 89
Black Flies 107
Boneset Stem Gall 88
Books on Entomology 114
Brown-tail Moth 27
Busck's Revision of Argyresthia 114
Buttonwood, Gall on 92

Cabbage Aphis 98
Caesar, L., articles by 15, 72, 100
Calopteryx maculata 49
Casey's Revision of Tentyriinæ 115
Caudell's Decticinæ of N. America... 115
Cecidomyia destructor 103
Cecidomyia Galls 86, 87, 88
Cecidomyia strobiloides 104
Cherry, Gall on 94
Cherry Scale (A. Forbesi) ....(figs.) 59
Chestnut, Gall on 93
Chionaspis furfura ....(figs.) 69
" pinifoliæ 71
Chittenden's Insects injurious to Vegetables 115
Chokeberry, Gall on 94
Choristoneura Galls 88
Cinquefoil Axil Gall 88
Codling-worm 17, 80, 95
Coleoptora, Captures of 125
Collectors of Canadian Insects, List of 117
Cosmopepla carnifex 24
Cottony Maple Scale 67
Crane Flies 107, 109
Curtis Scale ....(figs.) 57
Cynips strobilana 90

Dactylosphæra Gall 92
Decticinæ of N. America: Caudell... 115
Diastrophus Galls 88, 89
Didymops transversa 47

Page.
Diplosis grassator ....(fig.) 104
" tritici 103
Diptera (Two-winged Flies) 102
Diptera, Captures of Canadian........ 132
Dipterous Galls 85
Dogwood Leaf Gall 86
Dorocordulia libera 48
Dragon-flies, collecting and rearing. 43
" life history 45
Dyar's Mosquitoes of California...... 115

Elm, Galls on 86, 91
Enallagma Hageni 46
English Walnut Scale 61
Entomological Literature 114
Epicordulia princeps 48
Eriophyes (Gall Mites) 92
Eucosma Scudderiana 91
Eulecanium caryæ 66
" cerasifex ....(fig.) 63
" nigrofasciatum ...20, 65
Euura S-nodus 89

Fleas 105
Fletcher, J., articles by 9, 113
Forbes, or Cherry, Scale ....(figs.) 59
Fruit-tree Bark-beetle 15, 17, 97
Fyles, T. W., articles by 31, 102

Galls, Insect, of Ontario 85
Gibson, A., articles by 82, 113
Gillette's Chermes of Colorado Conifers 116
Golden-rod, Galls on 87, 88, 91
Gomphus brevis 47
" exilis 47
" sordidus 47
" spicatus 46, 47
Gooseberry Mildew 81
Gortyna cataphracta 25
Grant, C. E., article by 23
Grape-vine, Galls on 87, 94
Grasshoppers, Injuries from 23, 98
Green Bug 98
Gypsy Moth 27

Hagenius brevistylus 48
Halisidota caryæ 23, 82
" maculata 23, 82
Hampson's Catalogue of Lepidoptera Phalænæ in the British Museum... 116
Hawthorn, Gall on 86
Hemiptera, Captures of 129
Hemipterous Galls 91
Hessian Fly ....(figs.) 103
Hickory, Galls on 87, 92
Hickory Halisidota Tussock Moth.... 83
Hormomyia Gall 86
Hymenoptera, Captures of 127
Hymenopterous Galls 88

Iris Leaf Gall 85
Ischneura verticalis 47

Jarvis, T. D., articles by 50, 85

JAN 4 1912

Thirty-Ninth Annual Report

OF THE

Entomological Society

OF ONTARIO

1908

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1909

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TORONTO.

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present herewith for the consideration of your Honour the Report of the Entomological Society of Ontario for 1908.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1908.

CONTENTS.

PAGE.

OFFICERS FOR 1908-1909 6
LIST OF CANADIAN MEMBERS OF THE SOCIETY 7
ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO 9
Report on Insects of the Year: Division No. 2, C. E. GRANT 10
Division No. 3, J. B. WILLIAMS 10
Division No. 4, C. W. NASH 11
The White-marked Tussock Moth: PAUL HAHN 13
Conference on the chief Insect Pests of the season 15
The Interpretation of Nature: E. P. FELT 23
Entomology in the Graduate School of Agriculture, Cornell University, 1908: W. LOCHHEAD 31
Report of the Council 33
" " Montreal Branch 35
" " Quebec Branch 36
" " Toronto Branch 38
" " Treasurer and Auditors 39
" " Curator 40
" " Librarian 40
" " Delegate to the Royal Society 41
The Economic Importance and Food-habits of American Gall Midges: E. P. FELT 43
Observations on the Sorghum Midge: R. C. TREHERNE 47
Hydroecia micacea in Canada: ARTHUR GIBSON 49
Further notes on the Coccidae of Ontario: T. D. JARVIS 52
Some enemies of Ontario Coccidae: A. EASTHAM 54
Some Beetle haunts by an Amateur Botanist: F. J. A. MORRIS 56
Two additions to Montreal list of Butterflies: A. F. WINN 63
Collecting with a Lantern trap in 1908: J. D. EVANS 65
Notes on the occurrence of Lachnosternas in 1908: J. D. EVANS 66
Apparatus for collecting small Arthropods: T. D. JARVIS 66
A Catalogue of the Gall Insects of Ontario: T. D. JARVIS 70
Entomological Record 1908: JAMES FLETCHER and ARTHUR GIBSON 99
Insects of the year 1908 at Ottawa: ARTHUR GIBSON 116
Importation of Parasites of the Gypsy and Brown-tail Moths: L. O. HOWARD. 121
The Strawberry Weevil: WM. LOCHHEAD 124
What Entomology the Farmer and Fruit-grower should know: WM. LOCHHEAD. 125
Injurious insects in Ontario in 1908: C. J. S. BETHUNE 128
Injurious insects of Quebec in 1908: WM. LOCHHEAD 135
The Farmer's Wood lot: THOMAS W. FYLES 138
Life History of Euchaetias Oregonensis: H. H. LYMAN 145
Obituary notices: Dr. James Fletcher, Dr. W. H. Ashmead 147

ERRATUM.—On page 54, J. W. Eastham should read A. Eastham.

Thirty-Ninth Annual Report

OF THE

Entomological Society of Ontario,

1908.

To the Honourable JAMES S. DUFF, *Minister of Agriculture.*

SIR,—I have the honour to present herewith the Thirty-ninth Annual Report of the Entomological Society of Ontario, which contains the proceedings of the forty-fifth annual meeting of the Society which was held at the Agricultural College, Guelph, on the 5th and 6th of November, 1908. A full account is given of the discussions upon fruit-tree insects that took place, the papers that were read and the reports of the various officers and branches of the Society.

"The Canadian Entomologist," the monthly magazine of the Society, has been regularly issued during the past year and has now completed its fortieth volume. Its high scientific standard has been steadily maintained.

I have the honour to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,

Editor.

Ontario Agricultural College,
Guelph.

Entomological Society of Ontario.

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Province of Ontario.

Abbott, Dr. A. R	Toronto.
Aiton, Miss A	Highland Creek.
Albright, W. D	London.
Baker, A. C., O.A.C	Guelph.
Baker, A. W., O.A.C	"
Bethune, Prof., C.J.S., O.A.C.	"
Black, Davidson	Toronto.
Blackmore, Miss E.	"
Bock, H. P	London.
Bowman, J. H	"
Brodie, Dr	Toronto.
Brown, Walter	"
Buchanan, Dr. G. C	Beamsville.
Caesar, Lawson, O.A.C.	Guelph.
Calvert, J. F.	Orangeville.
Cockburn, Miss A	Hillside,
Coleman, R. E	Toronto.
Collingwood, J. H	Kintore.
Cosens, A	Toronto.
Creelman, Pres't, O.A.C	Guelph.
Dearness, Prof. J	London.
Dunlop, James	Woodstock.
Eastham, J. W., O.A.C	Guelph.
Elliott, W. H	Toronto.
Evans, J. D	Trenton.
Fisher, George E.	Freeman.
Fletcher, Dr. James	Ottawa.
Fraser, W. J	Toronto.
Frier, G. M., O.A.C	Guelph.
Gibson, Arthur	Ottawa.
Grant, C. E	Orillia.
Groh, H	Ottawa.
Hahn, Paul	Toronto.
Haight, D. H	Sudbury.
Hallam, M	Toronto.
Hallam, R	"
Hamilton, R. S	Galt.
Harrington, W. H	Ottawa.
Holland, W. H	Toronto.
Howitt, J. E., O.A.C	Guelph.
Ivy, M	Toronto.
Jarvis, T. D., O.A.C	Guelph.
Johnston, James	Hamilton.
Jones, D., O.A.C.	Guelph.
Kilman, A. H	Ridgeway.
King, R. W	Toronto.
Laing, J	Toronto.
Law, John	London.
Lawrence, C. A., O.A.C	Guelph.
Matthews, J. S	Toronto.
Maughan, J., Jr	Toronto.
McCready, Prof. S. B., O.A.C.	Guelph.
McMillan, G. O	Glenallan.
McRitchie, A. R	Kincardine.
Moore, T. J	Guelph.
Morden, J. A	Hyde Park Corners.
Morris, F. J. A	Port Hope.
Mosey, Miss	Toronto.
Nash, C. W	"
Pearson, Gerald	London.
Readwin, R	Guelph.
Richard, A. E	Ottawa.
Saunders, H. S	Toronto.
Saunders, W. E	London.
Silcox, Sidney	Toronto.
Slater, A. E	Port Hope.
Smith, Arthur	Toronto.
Stafford, E. W., O.A.C	Guelph.
Tanton, John	Kingston.
Thompson, W. Robin, O.A.C	Guelph.
Tothill, J. D., O.A.C	Guelph.
Treherne, R. C., O.A.C	"
Walker, Dr. E. M	Toronto.
Watson, Dr. A. H. R.	Port Hope.
Webb, J. H	Toronto.
Wheaton, R. R., O.A.C	Guelph.
White, James	Snelgrove.
Williams, J. B	Toronto.
Wood, S. T.	"
Young, C. H	Ottawa.
Zavitz, E. J., O.A.C	Guelph.

Province of Quebec.

Barwick, E. C	Montreal.
Begin, Rev. Abbe, P. A	Sherbrooke.
Bickell, Miss	Quebec.
Boulton, A. R. M	"
Boulton, Capt. J. G	"
Boulton, Mrs	"
Bowen, Miss	"
Brainerd, Dwight	Montreal.
Brainerd, H	"
Burgess, Dr. T. J. W	Verdun.
Campbell, J. G	Magog.
Chagnon, Gustave	Montreal.
Clark, Rev. Wylie, C	Quebec.
Denny, E	Montreal.
Dunlop, G. C	"
Elliott, W. R	Sherbrooke.
Faulconer, Mrs	Levis.
Faulconer, Miss Clare	"
Fosberry, C. S	Montreal.
Freeman, Miss I. H	Quebec.
Fyles, H	Levis.
Fyles, Miss W	"
Fyles, Mrs	"
Fyles, Rev. Dr. T. W	"
Geggie, James	Beauport.
Geggie, Miss Lois	"
Gibb, Lachlan	Montreal.
Griffin, A	"
Hamel, Miss Julia	Levis.
Hedge, Miss Louisa	"
Huard, Rev. Victor	Quebec.
Johnston, Miss M. G	Bedford.
Kollmar, E. J	Montreal.
Lindsay, Col. Crawford	Quebec.
Lochhead, Prof	Macdonald College.
Lyman, H. H	Montreal.
MacLeod, Miss E.	Quebec.
Moore, G. A	Montreal.
Norris, A. E	"

CANADIAN MEMBERS—*Continued.*

Poston, Mrs. T. A	Levis.
Reford, L	Montreal.
Robertson, Miss	Quebec.
Seton, Mrs. W. W	Levis.
Simmons, J. H	"
Simmons, Mrs. J. H	"
Southee, G. R	Outremont.
Swaine, J. M	Macdonald College.
Tourchot, A. L	St. Hyacinthe.
Turnbull, Lt.-Col. F	Quebec.
Turner, Hon. Richard	"
Turner, Mrs. R	"
Wade, Miss	New Liverpool.
Weir, Douglas	Montreal.
West, Dr. J	Magog.
Winfield, Mrs	Quebec.
Winn, A. F	Montreal.
Wood, Rev. Edmund	"

Alberta.

Baird, Thos	High River.
Dod, F. H. Wolley	Millarville.

British Columbia.

Abercrombie, Miss Ivy	Vancouver.
Anderson, E. M	Victoria.
Anderson, J. R	"
Armstrong, E. W	Salmon Arm.
Bryant, T	Ladysmith.
Bush, A. H	Vancouver.
Cockle, J. W	Kaslo.
Danby, W. H	Rossland.
Dashwood-Jones, W. H	New Westminster.
Day, G. O	Duncan's Stn.
Draper, R	Hillcrest.
Elliott, B. R	Victoria.
English, T. M	Cowichan Stn.
Foster, F	Vancouver.
Grassham, R. T	Keithly Cr'k.
Hanham, A. W	Duncan's Stn.
Harvey, R. V	Victoria.
Keen, Rev. J. H	Metlakatla.
Livingston, C	Duncan's Stn.
Luscombe, P	Cowichan Bay.
Marrion, H	Vancouver.
Mason, J., G.T.P	Copper River.
Reed, E. Baynes	Victoria.
Sherman, R. S	Vancouver.
Skinner, E. M	Duncan's St'n.
Taylor, Rev. G. W	Departure Bay, Nanaimo.
Towler, J	Vancouver.
Van Steenweyk, Miss	"
Venables, E. P	Vernon.
Wilmot, E. S	"
Wilson, T	Vancouver.

Manitoba.

Criddle, Norman	Aweme.
Dennis, A. J	Miniota.
Heath, E. F	Cartwright.
Hunter, Rev. A. J	Teulon.
Wallis, J. B	Winnipeg.

Nova Scotia.

Hervey, C. L. G	Round Hill.
Mackay, Dr. A. H	Halifax.
Payne, H. G	Granville Ferry.
Russell, John	Digby.

Saskatchewan.

Croker, A. J	Redvers.
Willing, T. N	Regina.

Honorary Members.

Cockerell, Prof. T. D. A	Boulder, Col.
Cresson, Ezra T	Philadelphia, Pa.
Edwards, Wm. H	Coalburgh, W. Va.
Howard, Dr. L. O	Washington, D.C.
Scudder, Dr. S. H	Cambridge, Mass.
Smith, Prof. J. B	New Brunswick, N.J.
Uhler, P. R	Baltimore, Md.
Webster, F. M	Washington, D.C.
Wickham, Prof. H. F	Iowa City, Iowa.

Life Member.

Saunders, Dr. William Director of the Experimental Farms of the Dominion.	Ottawa.

Entomological Society of Ontario.

ANNUAL MEETING.

The forty-fifth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 5th and 6th, 1908. Owing to the lamented absence of the President, Dr. James Fletcher, in consequence of serious illness, which terminated fatally on the following Sunday, the chair was taken by the Vice-President, Mr. Tennyson D. Jarvis, Lecturer in Entomology and Zoology at the O. A. College. Among those present were Rev. Dr. Fyles, Quebec; Mr. Henry H. Lyman, Montreal; Prof. W. Lochhead, Macdonald College, Ste. Anne de Bellevue; Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. F. J. A. Morris, Trinity College School, Port Hope; Messrs. C. W. Nash, J. B. Williams and Dr. Brodie, Toronto; Mr. Calvert, Orangeville; Mr. Collingwood, Kintore; President Creelman, Professors Zavitz, Hutt, Bethune, Messrs. Howitt, Eastham, Crow, Caesar, Klinck, McMeans and others, Guelph. There were also present a large number of students from the College, and on the Thursday evening of young women students also from the Macdonald Institute. The Society was favored with the presence of Dr. E. P. Felt, of Albany, State Entomologist of New York. Letters expressing regret at their absence were received from Prof. C. C. James, Deputy Minister of Agriculture, Directors C. E. Grant, Orillia; G. E. Fisher, Burlington; and C. H. Young, Ottawa; Dr. E. M. Walker, Toronto; Mr. John D. Evans, Trenton; Mr. A. F. Winn, Montreal; Mr. J. H. Bowman, London, and others.

During the first morning a business meeting of the Council was held at the Wellington Hotel, Guelph, at which their report was drawn up, and various matters discussed. It was decided to permit the formation of Nature Study Clubs in affiliation with the Society at any school in the Province on condition that there should be at least six members and that each Club should pay one dollar a year as a subscription to the funds of the Society; in return each Club should receive one copy of the issues of the "Canadian Entomologist" and a copy of the Annual Report for each individual member. The Society would also endeavour, on request, to send a representative to deliver a lecture on some natural history subject once a year if practicable. The following resolution of sympathy with Dr. Fletcher in his illness was adopted and a copy was sent to Mrs. Fletcher in order that it might be communicated to him.

"The members of the Entomological Society of Ontario have heard with deep regret of the serious illness of their esteemed President, Dr. James Fletcher, and of his enforced absence from this annual meeting.

"They desire to convey to Dr. Fletcher their earnest hope that his illness will be of no long duration and that he may soon be restored to health and strength. They beg to assure him of their warm sympathy with him in his sufferings and the interruption to his useful work."

The afternoon meeting was held in the spacious Massey Hall at the College and was largely attended. Mr. Jarvis took the chair at 2 o'clock and called upon the Directors of the Society to read their reports on the noteworthy insects of the year in their respective divisions. Mr. Fisher sent a letter explaining his inability to prepare a report for Division No. 5 owing to the pressure of business, and there was no report from No. 6 in consequence of the lamented death of the Director, Mr. J. A. Balkwill, which took place at London on October 10th.

REPORTS ON INSECTS OF THE YEAR.

DIVISION NO. 2.—MIDLAND DISTRICT. BY C. E. GRANT, ORILLIA.

The season of 1908 was a beautiful one, the finest summer I think I ever saw, but still there was no great outbreak of injurious insects and in fact no insects were particularly abundant as noted by me. On account of the small amount of rain in this section the plant lice were rather plentiful; I saw a field of turnips in September which were practically covered with them, but still the turnips were above the average size and the owner of the farm stated that he had taken no measures to kill them off.

Another insect, the yellow-necked apple-tree caterpillar, (*Datana ministra*) was remarkably abundant, some apple trees were nearly stripped of their leaves in the gardens around the town and the moths came in droves to my lamp.

The Buffalo beetle nuisance seems to be increasing, nearly all housewives are complaining of it and it seems hard to devise a perfect remedy for it.

Heliothis armiger is another insect which has been complained of as affecting the corn; the moths were flying in the day time over a clover field I visited in September and October along with *Plusia brassicæ*; I took both species in numbers; there had been corn grown in the next field.

This season I purchased a 7 amp. multiple lamp and had it installed on my verandah, the results were wonderful as to the number of insects attracted; the bombardment of *Lachnosterna fusca*, June beetles, in the spring was more than anyone but an Entomologist could stand and every now and then the deeper hum of *Belostoma americana*, the giant water-bug, would be heard, as this great bug thumped down on the verandah; during the month of June there was a constant and ever-changing stream of insect life. Unfortunately our power had to be shut down from the middle of July to the end of August, thus spoiling my sport. I got, however, several good things such as *Caripeta discivaria, Syneda Alleni, Apatela quadrata*, two new Plusias, *Oreta rosea*, and five or six *Eacles imperialis*. I took twelve species of Hawkmoth, the rarest here being *Smerinthus myops cerisyii* and *Sphinx luscitiosa;* one very handsome *Heterocampa* was also taken, if not *astarte*, it is very much like it. A new *Crocota* and several good things not, however, new to me such as *Mamestra nimbosa* and *latex*, and others too numerous to mention. If I had been present at the meeting I should have liked to have given a longer account of the numerous species attracted but as the directors are supposed to confine their report to injurious insects I will at some other time give a fuller list of what can be taken at Orillia, if it is thought desirable. I might mention one other capture in the daytime, namely, *Anisota virginiensis* (or *stigma*) taken on the edge of a wood flying about ten feet from the ground in the bright sunshine. *Junonia cœnia* was rather plentiful; I took four specimens in two weeks, *Colias eurytheme* was also taken several times.

DIVISION NO. 3—TORONTO DISTRICT. BY J. B. WILLIAMS.

I am not able to report very much this season as I was away in England most of the summer.

The Tussock Moth did a good deal of damage to the shade trees in Toronto. I noticed, in September, that a large part of many trees had been nearly stripped of their foliage. The late Park Commissioner, Mr. Chambers, always said that in many streets it was almost useless collecting cocoons because in adjoining private grounds the trees were infested with them, and the owners took no trouble to check their increase.

Our new Commissioner, Mr. Wilson, is getting a by-law passed to enable him to collect the cocoons on private grounds, as well as on the streets, and he has a grant of $5,000 for the work this winter; so we may expect to see some decided improvement in a year or two, if the work is thoroughly carried out.

Last year there was an almost total absence of Walking Stick Insects (*Diapheromera femorata*), in Niagara Glen, but this year they again appeared in countless hosts; some trees were quite stripped of their foliage by them, and they kept falling in numbers on the heads and shoulders of any passers-by in parts of the Glen where they were most numerous. Probably the cold weather in May and June last year prevented the eggs from hatching, and so they all lay over until the second year, as they are sometimes known to do, and then produced an especially numerous and voracious crop of Walking-sticks.

DIVISION NO. 4—EAST YORK DISTRICT. BY C. W. NASH, TORONTO.

In April last I attended two meetings of Horticulturists at Oakville. At these meetings the insect pests which infested the orchards of the vicinity were thoroughly discussed. Among those mentioned as being particularly destructive was the Tree Cricket. This insect is now very abundant in raspberry plantations and was said to do more harm in that locality than any other pest they had. Raspberry growers in other districts should be on their guard against this Cricket for where it becomes established it is somewhat difficult to control and it is capable of doing much mischief.

Although the early spring was cold and apparently unfavorable to insect life yet, when on April 12th I was cleaning up my garden, I found that under the shelter of the dead leaves which laid thickly over the flower beds, many forms were snugly and safely tucked away, waiting for warmth and sunshine to start them upon their summer activities. At the base of some of my shrubs small adult Lady beetles were very abundant; these I was not surprised to find, for like many others of their order, they hibernate in the adult stage, but when clearing up some hardy carnation plants, I was not only surprised but somewhat disgusted at finding upon them a large number of nearly full grown wingless green Aphids. That many species of Aphids hatch early and grow rapidly, I am well aware but this was the first time I had ever seen lively well-grown specimens flourishing when surrounded with ice crystals, upon plants which were still saturated with water from melting snow.

On May 5th from beneath a heap of dead leaves I raked out a handsome Red Admiral butterfly. It was living but very listless and weak.

Although for several years I have kept a sharp lookout, east of Toronto, for the Red Asparagus beetle I did not find it. This year, however, it appeared and by the end of the season outnumbered in some places the common Blue species. Both forms were abundant on the plants at the same time. The Red is much the more active of the two, flying off instantly when an attempt is made to capture it.

The Hunting Beetles (*Calosoma*) appeared to be much more abundant this year than usual, *C. calidum* especially being particularly common about the end of June.

Cosmopepla carnifex, which for the past three years had been steadily increasing in number, was entirely absent; I did not see one anywhere during the whole season. The Rose Beetle, too, has disappeared. This I can account for as the sparrows hunt for them most persistently and feed them to their young when in the nest. It may be that they also feed upon Cosmopepla but I have seen no evidence of it.

The Monarch butterfly did not make its appearance this year in this district until late. On July 8th I saw the first, a single one, very much worn and dull colored. On the 11th I counted about a dozen between Toronto and Highland Creek, a distance of sixteen miles; these were old and much worn. On the 20th of August new, fresh specimens were common and soon were mated.

Usually the migration of this species is at its height during the first week in September, after which but few stragglers are seen. This year I saw no migration in large flocks at all and stragglers were fairly common as late as the first of October, and the last was seen on the fifth.

House-flies have been comparatively scarce this summer and so were Mosquitoes until the evening of July 8th when they became fairly abundant, but at no time during the season have they swarmed in their usual hosts. Most of those examined were parasitized by mites, but this does not prevent their doing business in their good old fashioned way.

The Stalk borer (*Gortyna cataphracta*) was more abundant and destructive than ever before. This year I found the first young larva in the blossom stem of an Iris on the 15th of June. The larva was rather less than a quarter of an inch long and had evidently entered by boring a hole from the outside at about nine inches from the ground. As in 1907 I gave the full life history of this pest as far as I know it, I need not repeat it. No parasites have yet been bred by me from the larvæ of this moth, though I have carried a great many of them through to the imago stage.

While *Gortyna cataphracta* is a much dreaded pest in a flower garden, yet the damage it does rarely extends to the entire destruction of a plant; the affected stems are killed but the root is uninjured. All members of the genus are not, however, so considerate, for some of them work into the root-crown or the roots and thereby cause the death of the plant affected.

This summer I noticed that all my plants of *Aquilegia chrysantha* looked sickly and they scarcely threw out a healthy blossom. On August 20th the plants appeared to be dead. Upon pulling away the stalks which came off easily, the upper part of the fleshy roots was found to be hollowed out. A search in the soil yielded two chrysalids; they were lying about four inches from the roots and about two inches beneath the surface of the earth. These I took in and from them, on the 5th and 8th of September, moths emerged which are, I believe, *Gortyna purpurifascia*. One of them, shortly after emerging, deposited a number of eggs singly upon the surface of the soil in the jar where the moths were bred out.

If this moth becomes common, Aquilegia growers will require to look out for its larvæ or they will lose their plants. Strange to say while all my *chrsanthas* were destroyed, no other variety of Aquilegia was attacked.

Although I have grown Aquilegias for many years in Ontario, I have never before had one attacked by this insect nor have I ever seen any others so affected in this district.

I am sorry to say that at last I have positive proof that the San José scale has become established on the north shore of Lake Ontario. As yet, however, there are only two or three orchards infested, but past experience has shown that unless proper precautions are taken the pest will rapidly spread.

This year the Tussock Moth larvæ were about as abundant as usual. On the 13th of July I saw many spinning cocoons, at the same time there were numbers of them not more than a quarter of an inch long. Could the cold backward season have delayed the hatching of the eggs in some cases?

Although I have since 1887 paid a good deal of attention to this insect and each year have bred large numbers of them I had found but few parasitized. This season, however, in some parts of the City of Toronto it was the exception to find a pupa free from parasites, the chief of these being *Pimpla inquisitor*. As I have brought a number of specimens of the various parasites bred from the Tussock Moth larvæ which we can discuss at leisure, I need make no further reference to them now.

THE WHITE-MARKED TUSSOCK MOTH.

BY PAUL HAHN, TORONTO.

Being asked by our President, Dr. Fletcher, to deliver a report regarding the extermination in Toronto of the white-marked Tussock Moth (*Hemerocampa leucostigma*), which has done so much damage to our shade trees, allow me to state the following. (Fig. 1.)

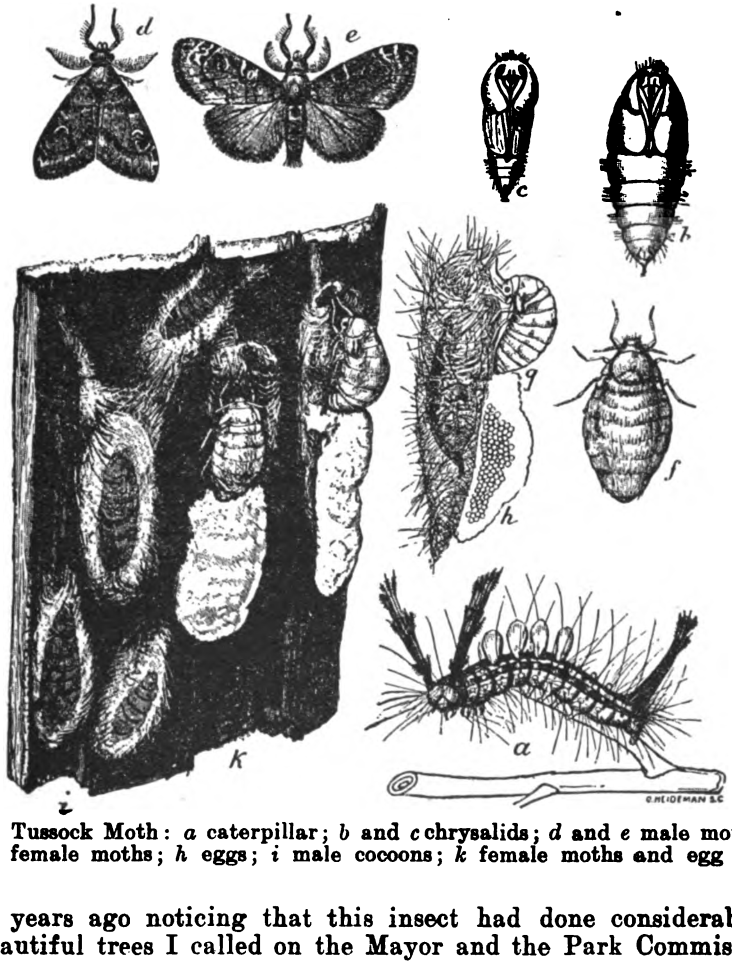

FIG. 1. Tussock Moth: *a* caterpillar; *b* and *c* chrysalids; *d* and *e* male moths; *f* and *g* wingless female moths; *h* eggs; *i* male cocoons; *k* female moths and egg masses on cocoons.

Two years ago noticing that this insect had done considerable harm to our beautiful trees I called on the Mayor and the Park Commissioner of our city.

I advised them strongly to collect the egg-masses and urged them to get a special permit from the Government to pass a by-law compelling citizens to rid their trees of these egg-masses.

Very soon after this visit I took ill and was unable to follow up the matter, having to go out of town for quite a long time. Last year I thought again about taking up the matter, but being still in poor health I had to abandon the idea.

I made out a report, called on the Board of Control, and bringing the matter up most forcibly at their meeting I persuaded them to give the Park Commissioner a grant of $5,000 to enable him to clean the city trees of these egg-masses, at the same time urging the passing of the by-law compelling the citizens to clean their trees.

On receipt of the grant of $5,000 the Park Commissioner at once sent out several gangs of men and they did splendid work in the infested places.

About October 1st the by-law was passed and it was published in all the papers, giving the citizens ten days' notice to have their trees cleaned. Should the property holders not comply with this request the city has full power to enter upon the premises, do the work and charge it up to the citizens. This charge to be levied and collected with the local improvement rates for the current year or other municipal rates.

Should it be necessary the Park Commissioner will engage the school-children again to collect the caterpillars and give them so much per quart, and if needed some spraying will also be done.

With the above method I feel sure the pest will be wiped out.

Dr. BETHUNE expressed his gratification at the success which Mr. Hahn had achieved in at length persuading the Board of Control in Toronto to adopt proper methods of dealing with the Tussock Moth trouble. It was a disgrace to the city that this insect should have been permitted for so many years to ravage the horse chestnut and other shade trees; the failure to deal properly with the pest was due to the late Park Superintendent who would not take the advice of Entomologists but adopted methods of his own, which were perfectly useless.

Mr. NASH: I have this to say that I think the whole trouble in Toronto may be very fairly charged to the late Park Superintendent. It was in 1887 that I first noticed the Tussock Moth in Toronto, and I called his attention to the fact, and he then gave me to understand that he knew all about it, that he required no advice nor assistance, and that he would do as he pleased in the matter. I think about the same time I spoke to Dr. Brodie and he said that he and other members had endeavoured to do something and that they had failed. However, from that time on the Tussock Moth increased. Application was then made for funds and every year he has been supplied with three or four thousand dollars. He could have used that money to very good advantage, but as a rule it was simply thrown away. They waited until the larvæ were about to spin their cocoons and he then expected to kill the insects by putting poisons on the foliage long after the caterpillars had ceased to eat. However, we have now a thoroughly educated man in charge of our parks, one capable of judging and observing for himself and willing also to take the advice of those who are experienced. It is not possible for us now to exterminate the Tussock Moth; it has spread all through the woods and is all over the country. I found it on Manitoulin Island and on St. Joseph's Island where it had done an immense amount of mischief. As everyone knows the egg-masses must be destroyed and this can very easily be done during the winter months.

CONFERENCE ON THE CHIEF INSECT PESTS OF THE SEASON.

THE LEAF BLISTER MITE.

The Chairman, Mr. T. D. **Jarvis**, announced that the rest of the afternoon would be devoted to a discussion of some of the chief insect pests of the season, taking up especially those injurious to fruit culture. The first to which he would draw the attention of the meeting was the Leaf Blister Mite (*Eriophyes pyri*) which attacks the foliage of the pear and apple, and has during late years slowly and steadily spread throughout Ontario. It is an almost microscopical mite and by its attacks causes little blisters to appear which become dark brown on the under side of the leaves.

Mr. **Caesar** showed some mounted specimens of the Blister Mite and stated that they are to be found on the under side of pear and apple leaves on which they produce dark swellings which look like a fungus disease. In travelling through the province this year he had found this Blister Mite in the Niagara district, at St. Catharines, Grimsby and other places; also in Essex county, some in Norfolk, a great deal in Prince Edward county, a considerable amount in Peel county. In his own home orchard in Peel county were some pear trees that had hardly a single leaf that was not covered with the work of the Mite. A year ago here at the College he found it in the orchard on the pears, but this year he could not find any. The only explanation that he knew of for its disappearance in the orchard was that the trees had been sprayed with lime-sulphur. It is found that this Blister Mite winters over in the nearly full grown stage. It is such a tiny little animal that it can hardly be seen with the naked eye. Before winter comes on it gets under the scales of the buds where the lime-sulphur wash may reach and destroy it. There is also another remedy that has given good results for the destruction of this pest, viz.: kerosene emulsion. Mr. Caesar did not know how injurious the pest might be, but from the diseased trees which he had seen, it must do a great deal of damage by lessening the power of the tree to supply food for its necessary growth.

Mr. **Jarvis**: It is interesting to hear that the lime-sulphur wash may destroy this pest. A species of this genus of mite with similar habits attacks perhaps forty or fifty of our forest and shade trees, and if the lime-sulphur will kill them, it will be a good remedy for the Soft Maple mite as well as many others which winter in the leaf buds.

Dr. **Felt**: The Blister Mite, in some parts of New York state has been very injurious. I noticed one place in particular where some trees were so badly infested by Blister Mites that one could see the brown foliage a quarter of a mile away, and when the foliage is in that condition there is no doubt that the trees are seriously injured. Our experiments go far to show that lime-sulphur or an application of miscible oils or kerosene emulsion in early spring is very effective in controlling the mites.

Respecting the value of the lime-sulphur wash on Maple trees it would depend on whether it would go under the bud scales and thus destroy the mites; he was doubtful whether it would do so.

Mr. **Jarvis**: I have had no experience with the lime-sulphur on these trees; I only suggested its use, but as Dr. Felt implies the scales of the Maple buds are very compact and perhaps the wash would not get into them so well as it would those that are looser.

Mr. **Caesar** wished to know whether the wash had ever been applied in the fall instead of the spring with the same good results.

Dr. **Felt**: I see no reason why the application would not be just as successful. In the case of the San José scale we do not hesitate to recommend the use of the lime-sulphur in the fall; I think the same would be true in the case of mites, but I would much prefer to advise putting it on in the spring. If the operations are delayed a little the buds will be slightly opened and you will secure greater results in that way. The material retains more or less its caustic value for a considerable period and the wash will, therefore, prove destructive to any mites which it reaches.

THE LESSER APPLE WORM (*Enarmonia prunivora*).

Mr. **Jarvis**: There is considerable interest being taken in the so-called work of the Lesser Apple Worm this season and I shall ask Mr. Caesar to introduce the subject.

Mr. **Caesar** exhibited a number of apples that had recently been sent to him from Prince Edward county and from St. Catharines. The senders believed that the injuries were due to some new worm. Mr. Caesar said that all he knew about this pest was what Professor Quaintance had described in his bulletin on the subject but that he was very anxious to get any information that any of the entomologists present could give him. He felt that the injuries on some five or six apples which he picked out corresponded very closely with Prof. Quaintance's descriptions and illustrations. On showing these to Dr. Felt the latter agreed with him that they were probably due to the Lesser Apple Worm. The other injuries Dr. Felt and others thought were not caused by this insect. Mr. Caesar said that if the first class of injury pointed out was due to the Lesser Apple Worm, it would appear that this insect was to be found throughout a large proportion of the best orchards of the province but that it was satisfactory to find that nowhere was it abundant. It was not an entirely new pest because Dr. Fletcher had reported its presence at Toronto, Prince Edward county and Ottawa several years ago. It is also very widely spread throughout British Columbia but Mr. Palmer, one of the Agricultural College students and a son of the Mr. Palmer who has furnished Dr. Fletcher with reports of its progress in the West, states that it is not increasing rapidly in British Columbia.

The life-history of the insect is very similar to that of the Codling Worm but, unlike the latter, instead of boring a hole into the core of the apple it lives near the surface, often causing ugly blotched mines either on the side or at the calyx end. These blotches are often as large as a ten cent piece, or even larger, and disfigure the apple greatly. It is believed that the spraying that controls the Codling Worm will also control the Lesser Apple Worm.

Prof. **Lochhead**: I have not observed its work at all in the Montreal district. The only reference to it I have had came from Kingston, so I have have had no experience in dealing with it. I do not think it has been reported from Quebec province.

Mr. **Jarvis**: It is so much like the Codling Worm that we may easily pass it by and not recognize it.

Dr. **Felt**: I wish to say that I have had no experience with the Lesser Apple Worm. We know, however, that the Codling Worm goes deeper into the apple, so it appears as though the apples exhibited may in some cases have been attacked by this less common pest. The only way, I think, that we can be absolutely certain about it is to find some of the larvæ at work. Although the larva of this insect is very like that of the Codling Moth, yet on careful comparison you can see a difference, particularly, if I remember correctly, at the posterior extremity.

THE APPLE MAGGOT (*Rhagoletis pomonella*).

Mr. **JARVIS**: The Apple Maggot is the larva of a little two-winged fly, and it is reported from a few places in Eastern Ontario. I should like to know if it has spread to any other districts.

Prof. **LOCHHEAD**: We found the Apple Maggot somewhat abundant in certain districts about Montreal. A few miles up the Ottawa River the Apple Maggot has been abundant for some years in a large commercial orchard and the owner has done everything in his power to control it. Just across the river from Como there is a farm where the Apple Maggot is known to be and we have two careful observers there, upon whose observatios I think we can depend. At St. Anne's, five miles from there, I have found the Apple Maggot in some of the old orchards on French farms. I have not observed it on the College trees. Then at Hull, further west, Mr. Reid, Secretary of the Quebec Horticultural Society, reports its presence; and at Covey Hill, near the boundary line between Quebec and New York. I have not seen it there myself. Mr. Swaine was in that district and he confirms Mr. Reid's observations. Then in the City of Montreal one of this College's graduates, who is in charge of the work this year, reports the Apple Maggot as doing serious damage. It is in the barrels in which the apples are packed for shipping. Sometimes he finds it hard to detect. The Apple Maggot, of course, works underneath the skin of the fruit and seldom comes close to the surface. It is difficult to tell when an apple contains one of these maggots. (Fig. 2.)

The only method that we can recommend for its destruction is clean culture and gathering and destroying all the apples that fall. It seems that the Apple Maggot does not leave the apple until full grown. As soon as the apple falls the maggot matures, crawls out and hides at or near the surface of the ground, and there pupates.

Now, it is thought that if hogs or sheep or any common stock are allowed in the orchard to pick up and destroy this fallen fruit the pest would be unable to develop and to pupate. I think that this is probably one of the best methods; but then again we have the point: no matter how careful we are, suppose our neighbors do not take steps for their control, would not the apple flies come over to us from our neighbors? It has been asserted that the flies are not given to the habit of flying from orchard to orchard but confine themselves to the same trees. I do not know how far that can be confirmed.

Going through Prince Edward county six or seven years ago I estimated that from one-third to one-half of the apples were damaged by the Apple Maggot. It does not seem to spread very far out of that particular district. It just seems to locate in certain parts and is not widely spread.

Mr. **GIBSON**: We have had reports from Ontario and Prince Edward counties regarding it this summer.

Mr. **CAESAR** thought the fly did not migrate as a rule. He had found in Prince Edward county a Snow apple tree which had been badly affected bv the maggot for three years, while the fruit on the other trees near by of the same variety was untouched. Tolman Sweets were attacked, but Spys and some others in the same orchard were not; Crab apples were also severely injured. It seems on the whole as if the insect preferred the early varieties. The fruit-buyers have now become sufficiently familiar with the pest to refuse to purchase fruit affected by the maggot; such fruit is only fit for the cider mill. Mr. Caesar did not mean to imply that winter apples were not attacked because in other orchards than the one referred to he found

Spy apples very badly affected. While in Prince Edward county he had met one man who had succeeded in almost completely destroying the insects by careful attention to fallen fruit. Hogs had been of great service in accomplishing this result.

Mr. JARVIS: While there is no doubt that the Apple Maggot attacks winter apples, yet my experience has been that it prefers Yellow Harvests to any other variety. I also find it in fall apples.

MALFORMATIONS OF FRUIT DUE TO INSECTS.

Mr. JARVIS: We should, I believe, now discuss another question that has interested us a good deal this year, viz: the cause of malformations of apples and pears. I hope anyone who has had any experience and has studied them will speak out and help in the discussion.

Mr. CAESAR: Here is an apple that was sent in by Mr. Sweny, son of Colonel Sweny, of Toronto, from British Columbia, to find out what was wrong with it. You will notice that there are several strangely elevated areas on its surface suggestive of the boils that rise on a person's body, if I may be allowed to use the comparison. There are also several rather deep depressions. The sender said that whole orchards last year and this year were affected in this way. He said that this year his neighbors had carefully drenched their trees with Bordeaux in the hope of getting free of the trouble. He had used lime-sulphur on his orchard. The result had been that his orchard, with the exception of some of his Duchess trees was very little affected, while his neighbors have had poor results from their spraying. I have very little idea as to what has produced this malformation that you see. Mr. Sweny says: "On Spys, Duchess, Wealthy and Ben Davis, the injury appears chiefly as a hollow, usually turning brown, with a dry brown spot running to the core. On peaches the appearance is the same, but the flesh is not affected." The specimen I have shown you is, he thinks, another form of the same trouble. If he is right in his belief that lime-sulphur has saved many of his apples this year it would, I think, stand to reason that the insect (for there is not much doubt that it is an insect) hibernates in some form on the tree and so is destroyed by contact with the wash. Bordeaux of course would not be expected to give good results against an insect.

There have been a number of pears and a few apples sent to us this year from Brooksdale and Bowmanville, Ontario. These were badly distorted by depressions and elevations. It looks very much as though the trouble is due to the punctures of some insect. When over in the State of New York this autumn I found similarly misshapen apples and asked the entomologist at Geneva what he thought was the cause. He said he had always attributed it to the Plum Curculio. A few days afterwards I showed the same fruit to Prof. Slingerland, who thought that it was not the Curculio but some species of Hemipterous Leaf Bug that had caused the injury.

Dr. Fletcher also thought the injury was due to some Hemipterous insect, possibly a Jassid (Leaf Hopper). I hope some one here has had some experience that will throw further light on this important matter.

No one present had devoted sufficient time to the subject to feel able to give any further suggestions. It was pretty unanimously agreed, however, that the injury was due to some species of insect.

After this specimens of the undoubted work of the Plum Curculio on apples were shown.

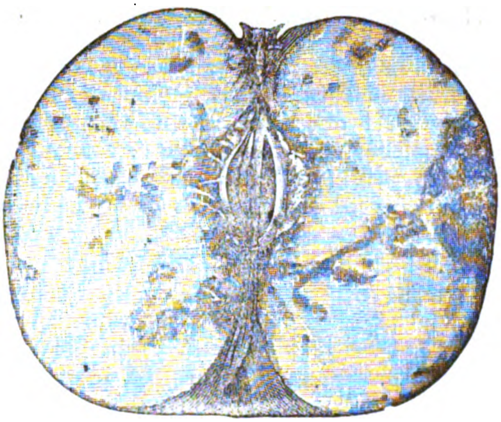

FIG. 2.. Apple affected by Apple Maggot.

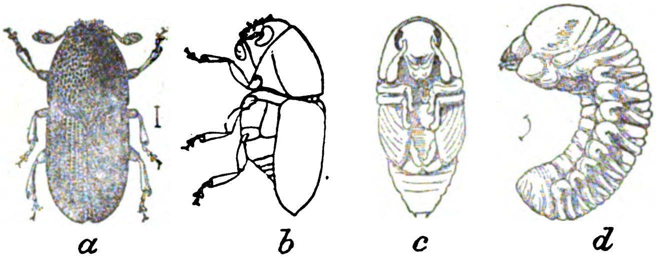

FIG. 3.—*Scolytus rugulosus*: *a*, adult beetle; *b*, same in profile; *c*, pupa; *d*, larva—all magnified about 10 times. (U. S. Dep't. of Agriculture).

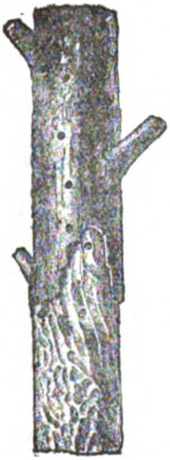

FIG. 4.—Work of *Scolytus rugulosus* in twig of apple—natural size. (U. S. Dep't. of Agriculture).

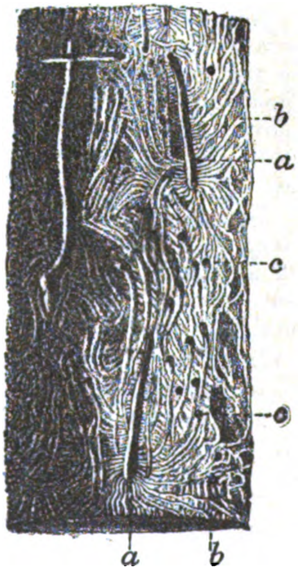

FIG. 5—Galleries of *Scolytus rugulosus* on twig under bark; *a*, *a*, main galleries; *b*, *b*, side or larval galleries; *c*, *c*, pupal cells—natural size—(after Ratzeburg, from U. S. Dep't. of Agriculture).

THE SHOT-HOLE BORER (*Scolytus rugulosus*).

MR. **JARVIS**: The Shot-hole Borer or Engraver-beetle has been doing considerable injury, or at least we think it has been doing so, during the past two or three years. At one time it was thought that the borer only worked on decaying wood or on unhealthy trees, but some of our fruit-growers are beginning to think that they cause the death of the tree. We would like to hear from any of the members who have had any experience with this beetle.

MR. **CAESAR**: The Shot-hole Borer was brought up and discussed last year at the annual meeting of the Entomological Society. We had hoped that its ravages would be checked by this year, but it has been so destructive this spring and fall that it is necessary, in justice to the Society, I think, and in justice to those who are interested in the work of the Society, that it should be brought to the attention of the members.

When I was down near St. Catharines on the 10th of June examining a fungus disease that was attacking the peach trees, Mr. McCalla—one of our best and most scientific fruit-growers,—asked me to come and look at his cherry trees. He had fifteen fine sour cherry trees apparently flourishing so far as the foliage showed at that time. but every branch up to half an inch in diameter was practically covered with exudations of gum. There were thousands of exudations on the trunks and all over the trees. Of course a tree cannot stand that sort of thing very long. On removing the gum with a knife one could see a little round hole quite clearly. A black beetle about a quarter of an inch in length was causing the trouble. Last year I found in about ten different districts perfectly healthy trees, both sour and sweet cherry, attacked by this same Shot-hole Borer, (*Scolytus rugulosus*). Figs. 3, 4, and 5.

Not more than two weeks ago a man near Grimsby, to whom I had recommended a method of treatment last year, wrote me that he had again this fall millions of these beetles. "I believe," he said, "it is the most difficult pest there is in the Province to combat. I have already this fall removed sixty of my cherry trees out of three hundred. I have taken out twenty loads of branches in addition and I am afraid I am going to lose every cherry tree I have got."

Just the other day I had a letter from Mr. Beattie, of St. Catharines, stating that his peach trees were being severely attacked. I have often seen a peach tree here and there throughout the district attacked but the sweet and sour cherry trees are by far the most commonly assailed, occasionally plum trees are rather badly attacked.

DR. **FELT**: You have found that they attack the healthy cherry trees as well as diseased ones?

MR. **CAESAR**: Yes, the fifteen cherry trees belonging to Mr. McCalla gave every appearance of being perfectly healthy when attacked. Many of the trees I found attacked last autumn were also healthy ones.

DR. **FELT**: Is it not probable that there is a great deal of dying wood in that district?

MR. **CAESAR**: There is a great deal of it. I am afraid that unless old orchards that have been killed by San José scale or trees that have died from other causes are cut down and burned, these may afford such excellent breeding grounds for the beetles that the fruit-growers may lose very seriously from the attacks of great numbers of them on healthy trees. The beetles certainly are increasing at an alarming rate.

My observations this year and last year lead me to believe that there are two periods in the year when they are specially destructive: First, in May, continuing on for some time into June; second, in August, continuing on through September. I might say that in no case hitherto have I been able to find either eggs or larvæ under a gum mass on a healthy tree; so that it would seem perfectly possible in many instances to save healthy trees even after they are attacked. If there were eggs or larvæ under the gum masses this would be impossible.

The treatment recommended last autumn in a circular letter to the press of the district was to cut down and *burn* before the warm days of the spring all dead and dying trees, and also any trees so badly weakened that there was small hope of their recovery. In addition, dead or badly attacked branches were to be pruned off and burned. This was to be followed by the thorough spraying of all the remaining trees with lime-sulphur in the spring. This was done in several orchards and no further trouble was found, or in those orchards where spring applications of an oil wash had been made. This is not sufficient, however, to prove that lime-sulphur or an oil wash, such as Carlson's Mixture, was the real cause of the absence of the beetles, though it looks as though such was the case. For the August attacks it seems probable that lime-sulphur or a lime and soap wash with a little carbolic acid in it would be very useful as a means of warding off the beetles.

Prof. LOCHHEAD: I remember that some years ago when dealing with the San José scale this Shot-hole Borer was very abundant in some districts where the scale had already killed the trees. I have always believed that the Borer attacked trees that were a little off-color or something wrong with their roots, and so not completely healthy. I do not see exactly why the borers should limit themselves to diseased trees; still it seems to be their natural habit to go to such trees.

Mr. JARVIS: I know of three peach trees in sod in the Grimsby district which are badly attacked by this beetle; close by there are other trees where the soil is cultivated, which show no evidence of this pest.

Dr. FELT: I have watched these insects for some years and know that generally speaking they do attack weakened or diseased trees. I believe, however, that they do, as mentioned this afternoon, sometimes attack perfectly healthy trees. The real source of the trouble in such cases is not necessarily due to their breeding in the immediate neighborhood. Dr. Hopkins has recorded flights of the beetles evidently coming from a considerable distance and I believe that they fly in more or less large swarms. My impression is that the beetles that have attacked the healthy trees referred to have probably come in swarms of greater of less extent. I think the only practical solution of the difficulty is to get the fruit-growers interested and remove all the dead material. Then let them, as suggested, put on their lime-sulphur. If it does not ward off the beetles it will at least pay for itself by warding off fungus diseases.

In answer to the question whether he agreed with the statement that there were apparently two main times in the season that attacks were to be feared, Dr. Felt said he believed the statement was correct so far as he knew.

APHIDS.

Mr. JARVIS: The cabbage Aphids have been increasing year after year now for several years. We get a great many letters asking for remedies. We find it very difficult to get any really satisfactory remedy that seems practicable.

Mr. **Caesar** said he was afraid that no remedy could possibly ward off attacks because he thought that winged females flew from plot to plot and rendered all remedies more or less futile.

Mr. **Bethune**: I think that it is the long continued dry weather that has allowed the Aphids to become so very numerous and destructive this year. It is very difficult to suggest a remedy to a farmer who is growing turnips by the acre, because he will not apply a troublesome spray, and what I recommend them all to do is to be on the lookout when they are hoeing the crop and trample underfoot any affected foliage. Some farmers said that their crops were entirely destroyed, while others said that the turnips were all right though the foliage was very badly affected.

Another insect which has been serious in a great many places is the Turnip Maggot, similar to the Cabbage Maggot. These insects cause the turnips to be all distorted and with woody or rotten spots. They are then useless for any purpose as the cattle will not eat them and they are of no use in any other way. I do not know any remedy that is really practicable for dealing with this insect.

The Bag Worm.

Mr. **Jarvis**: I wish to call your attention to another insect that was found by Raymond Zavitz, of Guelph, this year, the Bag Worm. It was found on a cherry tree. I think it has been found here for the first time. I would like to hear what Dr. Felt says about this pest. We have it here this year and it is probably the first time that it has been reported in the Province. I saw a note about its being found in New York State.

Dr. **Felt**: The Bag Worm is in New York State, rather commonly about New York City, and I should say off and on ranging rather abundantly for thirty miles around. This last summer I was rather surprised to receive the Bag Worm from Red Cedar, forty miles south of Albany. I think it is an unusual record for New York State and just why you should find the insect here I do not understand, because this must be equivalent to about fifty miles further north than the latitude of Albany, and perhaps the weather is a little more extreme in winter.

Dr. **Bethune**: I had a specimen of the moth given to me two years ago, which was taken in this part of Ontario and I thought it was extremely remarkable. I never heard of the Bag Worms in Ontario before. Here in Guelph we are just on the verge of the upper Austral and the Canadian Boreal zones and we get a little of the fauna and flora of both zones, so that we find a few insects reach us here that hardly extend further north or south, as the case may be, and it seems we are free from most of the southern species which are troublesome along the shores of Lake Erie. This insect certainly is remarkable for having come to such a point as this.

As far as these zones are concerned I suppose we are rather more than fifty miles further north than Albany. It is never safe to say where the line between these zones should be drawn.

We find many things growing quite luxuriantly about Dundas and in the vicinity of Hamilton, which will not grow here at all. We are, I think, about 1,100 feet above the level of the sea and are more than twice as high above Lake Ontario as the Hamilton Mountain, so that there is a difference in altitude as well.

After some further informal discussion on a variety of injurious insects, the meeeting adjourned.

EVENING SESSION—THURSDAY, NOVEMBER 5TH, 1908.

A public meeting was held in the Massey Hall building of the Ontario Agricultural College, and was largely attended by members of the Society, students of the College and Macdonald Institute and visitors from the city. The chair was taken by Dr. Bethune, Professor of Entomology. The proceedings were very much enlivened by musical selections excellently rendered by the College Orchestra.

The chairman, in his opening remarks, referred in feeling terms to the great regret that was felt by all at the absence of their President, Dr. James Fletcher, who was seriously ill in a hospital at Montreal. Being the forty-fifth annual meeting of the Society, of which he, the chairman, was one of the founders, he gave a short account of the history of the Society and of the good work which it has accomplished during all these years. He then introduced, as the chief speaker of the evening, Dr. E. P. Felt, of Albany, the State Entomologist of New York, who was widely known from the numerous books and papers on economic and systematic entomology that he had published; though still a young man he had attained a high reputation due to the excellence and thoroughness of his work. Dr. Felt then gave the following lecture on "The Interpretation of Nature," which was illustrated with a large number of beautiful and interesting lantern slides.

THE INTERPRETATION OF NATURE.

BY E. P. FELT, ALBANY, N.Y.

Our civilization is based on the accumulated wisdom of the ages. The ancient lore of the Chinese, the mystery of the Hindoo, and the culture of the Greek, all have had an important influence upon the development of the human race. The learned man acknowledges his debt to these and other sources of wisdom. None take issue with Pope when he writes: "The proper study of mankind is man." We would go farther and say: The proper study of mankind is man, the earth and the fulness thereof. Even as ignorance of the wisdom of the ancients restricts the usefulness and activity of the individual, so does a failure to understand the laws governing the existence of other forms of life, circumscribe the power of dominant man. In other words, the welfare of man is most closely bound up with that of a number of animals and plants. Detailed knowledge of these latter is essential to continued progress. One can not be separated from the other.

Nature is kind to the student of economic entomology, since she gives him five or six opportunities to identify an insect, namely, the egg, larva, pupa, adult and work. This kindness is not always so apparent, especially when it is remembered that this abundance and variety of form means a corresponding increase in the number of characters to be memorized, particularly as an entomological constituency frequently expects identification in all stages. The story is easy to decipher if the page has been previously studied, otherwise its translation may be as difficult as that of the Egyptian hieroglyphics. Not infrequently neither the egg, larva, pupa, adult, work or debris is at hand, and the entomologist may be called upon to separate fact from poor or absolutely misleading descriptions. In the latter event, it not infrequently happens that an intimate knowledge of local conditions is of vast service in reaching a satisfactory conclusion.

The work of the economic entomologist only begins with the identification of the insect. This step is simply a means to an end. Now, he is called upon to exercise his proper function as an interpreter and to render an opinion as to the nature of the insect. His prognostication depends upon several factors, the most important of which is a knowledge of the insect and its previous history in the locality under consideration. This is of much service in the case of well known insects but of comparatively little value when an unusual outbreak occurs. Then he must fall back upon his knowledge of the general habits of the group, supplemented in not a few instances by an understanding of the local conditions. Furthermore, he must take into consideration the influence of climate and the likelihood of parasites being abundant enough to check an outbreak in its incipiency. Recommendation naturally follows prognostication and is determined in large measure by the previous findings. It frequently happens that, owing to the nature of the crop infested or the character of the outbreak, direct control measures are impossible. An intimate knowledge of the possibilities may result in a different rotation of crops being advised or modifications in culture. The wisdom of applying direct insecticides, such as the internal poisons or those destroying by contact can be determined only by a variety of conditions. We must take into account the time of year, the condition of the crop, particularly if it be fruit, and the recommendations may not only vary from year to year but be widely diverse in different seasons of the same year.

The Bark Borers are extremely interesting forms and we propose to discuss a number of species very briefly because of the most admirable records they give concerning the identity of the form responsible for the mischief, the time when the injury was inflicted, the sequence of the species working in the bark and a variety of interesting biological data, all of which may be gleaned by a study of their workings.

The small, pale, yellowish, gummy exudations on the limbs of peach trees are very suggestive of the Fruit-tree Bark-beetle (*Eccoptogaster rugulosus*, Ratz.). It is only necessary to make an examination and find the circular exit holes or to disclose the characteristic galleries lying beneath the bark, in order to confirm our suspicions. The early work of this insect is very beautiful, showing the longitudinal gallery made by a single female and the numerous, more slender larval tunnels, the latter increasing in size with their length and ending in a pupal cell. This species is occasionally so abundant in New York State as to literally destroy the inner bark and thickly score the sapwood. This illustration shows such a condition and also represents the work of a wood-pecker. This bird not only removes the outer bark in its search for the grubs and pupæ, but frequently splinters the wood in its eagerness to secure such delicacies. The Hickory Bark-borer (*Scolytus quadrispinosus*, Say) is related to the preceding and has a very similar method of operation. The female enters at one point, continues her gallery with the grain of the wood, depositing eggs on either side. The larval galleries diverge therefrom as in the preceding species. It is comparatively easy to estimate the prolificacy of an individual by counting the larval burrows originating from the tunnel of a female. This species is occasionally very injurious to hickories in New York State. The Red Cedar Bark-beetle (*Phloesinus dentatus*, Say), though rarely abundant enough to cause material injury, is extremely interesting because of the beautiful and very characteristic galleries it makes in its food plant. There is almost invariably a three-lobed chamber at the point of entry, while the long, slender larval tunnels, just grazing the white wood, present a strong contrast to the dark brown bark delimiting their margins. Most interesting of all, we occasionally find a piece of fossilized wood engraved by one of these borers. We have before us an illustration representing a piece of arbor vitæ from the interglacial beds in the vicinity of Toronto, and the carvings, though faint, tell interesting stories of early life on this continent. The form of these galleries is so characteristic that Dr. Hopkins, our American authority on this group, referred the maker (*Phloesinus squalidens*, Scudd.) to a genus and on account of the restricted food habits of its allies, gave a provisional determination of its food plant. The Ash Bark-beetle (*Hylesinus aculeatus*, Say) presents another type, since the adult galleries diverge from a common point, indicating, as we are told, that two females are probably responsible for their construction. The borings are beautiful in their regularity.

Some of these insects are very injurious to our forest trees, and a study of their habits has therefore a practical, as well as a scientific value. It is interesting to note what can be learned from a large pine tree which has evidently been dead some years. The bark may have largely disappeared, as in the case illustrated, but a close examination of the lower portion of the trunk shows that the sapwood has been badly scored by some borer, and a little familiarity with the habits of these insects would enable us to name the offender. Before attempting this, let us look at the condition of two pines as they were in September. One is apparently in excellent condition while the top of the other has perished. The needles of both, though not shown in the illustration, were decidedly unhealthy and by the following spring the trees were bare and the bark had begun to peel. An examination of the lower portion of the trunk shows a number of pitch tubes, indicating clearly that certain bark beetles had been at work before life was extinct. A pitch tube is nothing more than particles of pitch carried by the insects from their burrows and laid around the mouth of the exit. The insect responsible for this work is known as the coarse writing bark beetle (*Tomicus calligraphus*, Germ.), a species which makes a very characteristic series of galleries and confines its operations almost exclusively to the thicker bark of the lower portion of large trees. Occasionally a dead tree may be found standing and give little external evidence as to the cause of injury. A closer examination may result in finding circular exit holes here and there upon the bark. These invariably mean that insects have been at work beneath. The removal of a large piece of bark may reveal a confused mass of galleries frequently nearly filled by borings and decaying particles of bark. Apparently there is little of significance, but on brushing away the debris, we sometimes find a few galleries preserved by infiltrated pitch, incontrovertible evidence that the pine was attacked while alive. The tree, in making an effort to recuperate from the injury, exudes pitch. This latter infiltrates the walls of the galleries and thus a record of injury may be preserved for years. The bark borer is followed in turn by certain species which live upon the dead inner bark, and in some instances also upon dying wood. One of the most characteristic of these is *Rhagium lineatum*, Oliv., a species which produces, between the bark and the wood, very characteristic pupal cells, the walls of the latter being composed largely of white fibres torn from the sapwood. *Pytho americanus*, Kirby, is an ally of the same and, like its associate, constructs between the bark and the wood a distinctive pupal cell, the walls of the latter being composed entirely of almost rotten bark borings. The two last named species may also be found in association with Monohammus, the larvæ of which are perhaps better known as sawyers. The exit holes of Monohammus are large, irregular, not sharply defined. The galleries made by the larvæ are easily recognized, since they are broad, irregular, traverse both bark and wood, occasionally entering the latter to a considerable depth, and are invariably accompanied by coarse, sawdust like borings.

The coarse writing bark beetle mentioned above is usually hardly more than an assistant to the pine bark beetle (*Tomicus pini,* Say). This latter is a smaller form and confines its operations to the thinner bark of the middle of the tree and on the larger branches. Its galleries, like that of its associate working below, are very characteristic and, in some instances, extremely beautiful. Not infrequently this insect breeds in such large numbers that the bark is fairly dotted with its exit holes, while the tissues beneath are riddled by numerous galleries of both adults and larvæ, not to mention the borings of young Monohammus larvæ, frequently found in these situations. Later, Rhagium and Pytho may occur, though as a rule, not so abundantly as under the thicker bark at the base of the tree.

The Balsam Bark-borer (*Tomicus balsameus,* Lec.) is another extremely interesting species. It is occasionally quite injurious to its food plant. The early work begins with an irregular central chamber with two or more transverse adult galleries, the larval burrows being usually with the grain of the wood. This insect breeds throughout the length of the tree and occasionally a group of adults, starting from one central chamber, may entirely girdle a young twig, though this method of work is somewhat exceptional. Three transverse galleries originating from a central chamber is somewhat typical of this insect's work. The plan of operation is frequently obscured in a badly infested tree by interlacing of the galleries and the development of fungus in the decaying tissues. Under these conditions, the only evidence we know of to show that the tree was attacked while alive is the occurrence, in small chambers here and there, of masses of dried balsam. These accumulations usually result from balsam flowing into cavities from injured living tissue.

It will be seen from the preceding that much can be learned from comparatively obscure signs when one understands their significance. The galleries of various bark borers are so characteristic as to permit of the ready identification of most species, and in not a few instances the determination of the plant affected. Furthermore, the condition of the tree at the time of attack can be determined with a considerable degree of confidence and the sequence of the species ascertained. The same is true of insect work in many other groups though it is not always so susceptible of proof. Many times the signs have little or no significance because we fail to comprehend their import.

Records of insect work are sometimes made under other than natural conditions. Certain species invade the house, and, unfortunately, many of us are too familiar with signs of their presence. Occasionally, as in the instance under consideration, the insect is the sufferer. This particular case is of special interest, since it is practically an artificial fossil, a large June beetle (*Lachnosterna*) having been literally crushed into the paper during the process of calendaring. Note the preservation of the antennæ and legs, suggestive of what might be done along this line with other species. Incidentally, we wish to call attention to the melancholy fact that a few individuals, insect as well as human, attain notoriety only when they make an exit from this world in an unusual manner.

Turning now to some forms which are of great interest to residents of cities and villages, allow me to give you a little idea of their importance in an adjacent State. The work of the White Marked Tussock Moth (*Hemerocampa leucostigma,* Sm. & Abb.) is so well known that we unconsciously associate defoliated horsechestnut trees with the presence of this insect. It has been very destructive in recent years in many cities, and villages of New York, particularly at Buffalo. Furthermore, judging from accounts which have come to our attention, certain Canadian cities have not been altogether free from the ravages of this beautiful caterpillar. The wingless female is probably well known to most who are at all interested in preserving our shade trees, while the characteristic white egg masses need no description at the present time. The control of this insect is easily affected, either by collecting egg masses or thorough spraying with an arsenical poison at the time the young caterpillars begin operations. The selection of one method to the exclusion of the other must be governed largely by local conditions.

The Elm-Leaf Beetle (*Galerucella luteola*, Mull.) is another species which has been very injurious to elms for over a decade in the Hudson valley. It has recently become quite destructive at Ithaca, N.Y., and will presumably inflict considerable injury upon elms in other cities in the western portion of the State. Saratoga Springs and its vicinity seems to be the northernmost limit in New York State where serious injury is likely to occur. It displays a marked preference for the English and Scotch elms and, under certain conditions, may become injurious to the American elm. The larvæ feed exclusively on the lower surface, leaving the tough upper epidermis unbroken. The leaves are skeletonized, only the mid and lateral ribs, supported by a thin, brown membrane, remaining. This habit of the larva makes it imperative to apply the arsenical poison to the under surface of the leaves.

The Snow-white Linden Moth (*Ennomos subsignarius*, Hubn.) attracted a great amount of attention, because the delicate, snow-white moths appeared in myriads about the electric lights of New York City, various other localities in the Hudson valley north to Saratoga and along the Mohawk valley westward to Utica. Reports of similar flights also came from northern New Jersey, from Springfield, Mass., and Ottawa, Canada. This species has not, in recent years at least, attracted notice on account of injuries to shade trees, and even during the past summer there was no marked damage by the caterpillars of this insect to street trees. There were, however, serious outbreaks by this species in both the Adirondacks and the Catskills, the injuries in the latter locality having been preceded by extensive defoliation the preceding year. The light brown, barrel-shaped eggs of this insect are deposited in clusters upon the bark, and a search for them should give some idea as to the probability of the injuries being repeated another season.

The Sugar-Maple Borer (*Plagionotus speciosus*, Say) is rarely seen, though its operations upon sugar maples are very evident in many localities throughout New York State. The initial injury is usually marked by an oblique elevation on the trunk or near the base of the lower branches. This overlies the gallery of the grub and is caused by the abundant formation of new tissues along the line of injury and the consequent pushing up of the old bark. The latter, in case of a bad injury, eventually cracks, exposes the wood, and after a series of years, owing to the deficient circulation, both above and below the oblique part of the wound, the bark dies back till we have a large bare space, usually accompanied by the death of the limbs on that side of the tree. The exposed tissues decay and eventually wind and storm bring about the destruction of magnificent trees. This insect may be regarded as one of the most serious enemies of maples in New York State, though its work is conducted in a very unobtrusive manner.

The Gipsy Moth (*Porthetria dispar*, Linn.) should be mentioned in this connection, though it has not yet been found in New York State. It has become established in two Massachusetts localities within fifty miles of our line. The control of this insect is of great interest to all States liable to become infested. It would be a rash individual who would dare to say that any locality in the Northeastern United States or in a territory adjacent to the north might not be invaded by this insect within a decade. Defoliated woodlands are characteristic of a bad infestation by this species. The caterpillars not infrequently become so abundant as to form large clusters at the base of trees, sometimes fairly covering the trunks as they range themselves side by side. The caterpillar itself is an inch and a half to two inches long, hairy, dark grayish, with a double row of warts down the middle of the back, the ten anterior blue, the twelve posterior red. The insect is also easily recognized by the heavy bodied, dingy white female lightly and irregularly streaked with black and gray, in connection with the conspicuous yellowish or buff colored, oval egg masses about an inch in diameter and appearing much like a section of a sponge.

The Brown Tail Moth (*Euproctis chrysorrhœa,* Linn.) though a more recent introduction, has become much more widely disseminated than the preceding. It has not yet become established in New York State, though it occurs in Nova Scotia. The winter nests of this species are very familiar, while the snow white, brown-tailed moths and the orange brown caterpillars, with a conspicuous row of white spots on either side and two bright red spots near the posterior extremity, are easily recognized. This insect is not nearly so injurious in Massachusetts as the Gipsy Moth.

The control of these two introduced species is of great importance to all residing in territory likely to become infested, since the more thoroughly the inscet is kept in check, the less chance there is of its becoming established in new territory. Massachusetts authorities are using thoroughly up-to-date power spray apparatus for the application of arsenical poisons to shade and forest treees. Recent improvements have resulted in greatly increasing the capacity of the ordinary spraying outfit by replacing the usual six horse power gasolene engine, weighing some 1,800 pounds, by a ten horse power engine made especially for automobiles and weighing only 400 pounds. Furthermore, a heavier and more powerful pump has been employed, the whole weighing no more than the usual spray outfit. The machinery is mounted upon a stout wagon with a 400 gallon tank, and a heavy inch and a half hose some 400 to 800 feet long, with a smooth quarter-inch nozzle, is employed. A pressure of 200 to 250 pounds is maintained. The hose is handled much as though a fire was in progress. Ten men, at intervals of six or eight feet, carry the end of the hose, the nozzle being in charge of a superior man, with instructions to keep it moving all the time. The pressure is sufficient to throw the insecticide 40 or 50 feet and the resistance of the air breaks it into a fine spray. The foliage is well covered if the nozzle is handled intelligently. This giant outfit is particularly adapted to work in woodlands. It usually requires four horses and is capable of spraying 14 to 16 acres a day, much depending upon conditions. The cost of treatment in this manner is reduced to about $10.20 per acre where the woodland is fairly clear of underbrush. An interesting modification of this apparatus has been employed for spraying strips along the road side, and it could probably be used, under some conditions at least, upon shade trees. It simply consists of a giant extension nozzle mounted on a universal joint so that the tip may be lifted 40 or 50 feet from the ground. This last named apparatus, with a favorable wind, can cover a strip 400 feet wide.

The work with parasites of the Gipsy and Brown Tail Moths, conducted by the State of Massachusetts in co-operation with the Federal Government, is most encouraging. The work of 1907 has been considerably extended in providing larger quarters and a more adequate staff. Furthermore, efforts have been made to secure larger sendings from European countries, and a special agent was dispatched to Japan. This latter undertaking has proved most encouraging, in that a large Apanteles and a new egg parasite of the Gipsy Moth have been received from Japan. The Apanteles has been bred through one generation in American caterpillars. The sendings from Japan have, in addition, resulted in the introduction of four species of Tachinidæ which promise to be very efficient parasites of the Brown Tail Moth. Marked improvements have been made in methods of handling and rearing parasites and other natural enemies. This latter justifies the expectation that it would be practical to breed thousands of the more effective species prior to their being liberated under favorable conditions. This work with the parasites may rightly be considered as most important, owing to the fact that the Gipsy Moth is now so widely established as to render any widespread method of control, aside from that with natural enemies, exceedingly costly.

There are several fruit tree insects worthy of mention in this connection, though most of them are so well known that comparatively little that is new can be given. The Codling Moth (*Carpocapsa pomonella*, Linn.) lays heavy tribute upon our fruit growers, causing an annual loss on the apple and pear crop of New York State estimated at $3,000,000. The operations of the Apple Worm are too familiar to require description, and the same is true of the characteristic pupal cells found under the bark. The parent insect is less frequently seen and the transparent, whitish egg, sometimes deposited upon the fruit and frequently upon the leaf, practically escapes observation. Our fruit growers rely almost entirely on thorough spraying with an arsenical poison, making the application when the green sepals are still open. Arsenate of lead, in the experience of one pear grower at least, has proved much more effective than other poisons in controlling this insect upon that fruit.

The Cigar Case-bearer (*Coleophora Fletcherella*, Fern.) has caused much injury to fruit trees in some sections of Western New York. This species appears to be much more destructive in that region than in the Hudson valley. The brown, cigar-like cases are about one-quarter of an inch long and easily recognized by their characteristic form. The young caterpillar, as is well known, eats a little hole into the leaf and then devours the more tender parenchyma lying between the upper and lower epidermis. This habit renders its control somewhat difficult, though an early application of a poison at the time the leaves begin to appear has proved very effective.

The Blister Mite (*Eriophyes pyri*, Nal.) has been unusually destructive in certain orchards in Western New York and its presence has also been noticed in the Hudson valley. The work of this species is quite characteristic though it presents a somewhat superficial resemblance to that of the case bearer mentioned above. The blisters caused by the mite are invariably raised, somewhat thickened, and there is a small, irregular, circular hole near the center of the blister. The venation also disappears in the affected area. These characters serve to separate its work from that of the case bearer mentioned above, while the thickening of the tissues at once differentiates it from fungous attack. Spraying in early spring with either a lime-sulphur wash or a whale oil soap solution has proved effective in controlling this species. The advisability of making such an application must be determined largely by the abundance of the mite.

Several scale insects are more or less common in New York State orchards. An old and common enemy is the Oyster Scale (*Lepidosaphes ulmi*, Linn.), a species which is sometimes quite abundant upon young fruit trees and is especially likely to be numerous on ash. It is easily controlled by thorough applications of either a whale oil soap solution or a kerosene emulsion, the latter part of May or early in June at the time the yellowish young are most abundant. The Scurfy Scale (*Chionaspis furfura*, Fitch) is another old enemy, which in recent years has proved somewhat more destructive than the Oyster Scale mentioned above. It can be controlled in the same way. The San José Scale (*Aspidiotus perniciosus*, Comst.) has become well established in a number of sections in New York State and our more progressive growers are quite confident of their ability to keep the insect in check. Early spring applications of a lime-sulphur wash, or a miscible or so-called "soluble" oil are the two methods most extensively employed. We think it safe to say that by far the most of our fruit growers rely upon some preparation of a lime-sulphur wash and, as a rule, obtain very satisfactory results. The application is generally made in the spring, the more thorough growers making a practice of giving two sprayings, with the wind in opposite directions, whenever possible.

In conclusion, we wish to call attention to one of the most important of economic insects. The welfare of our forests, the preservation of our shade trees and the production of large quantities of farm produce, while valuable and in may ways essential to happiness, is of no avail if life be in danger by reason of neglect of ordinary sanitary precautions. The ubiquitous House-fly, tolerated for ages and assumedly an inevitable nuisance (not to use a stronger word) has come to be regarded as one of our most important economic insects. This change in attitude is due to the recent discovery that, under certain conditions at least, the House-fly may be an important factor in the distribution of typhoid fever and the germs responsible for certain other grave intestinal disorders. It is stated that there are 350,000 cases of typhoid fever annually in the United States, about 35,000 proving fatal. Recent investigations in the City of New York, conducted under the auspices of the Merchants' Association, show a remarkably close parallelism between the abundance of flies and the occurrence of typhoid fever and related infections. It is not necessary at this time to give full details respecting this insect. The House-fly is a child of filth with inherited tastes perverted beyond the possibility of reclamation. Furthermore, its breeding places are comparatively restricted. It is entirely within practicability to reduce its numbers to an almost negligible quantity He who is indifferent to this insect and its possibilities might well dance on the edge of a crumbling cliff overhanging a deep chasm inhabited by one of the most hideous forms of death. This is strong language. The situation justifies it. The suffering of a typhoid patient and the heavy pall of grief falling upon the afflicted family, cannot be adequately depicted by words. The true relation of the House-fly to the welfare of man must be known. This bearer of malignant germs should be excluded from our homes and a campaign begun which should eventually result in the practical eradication of this insect from the haunts of man.

ENTOMOLOGY IN THE GRADUATE SCHOOL OF AGRICULTURE, CORNELL UNIVERSITY, JULY 6-31, 1908.

By Wm. Lochhead, Macdonald College, P.Q.

It was somehow or other unconsciously taken for granted by all students of insect life that Entomology would form one of the parallel courses offered during the summer session of the Graduate School at Cornell University. To have a School of Agriculture at Cornell without Entomology was hardly possible, even thinkable, for did not four-fifths of all the Experiment Station workers and teachers in Entomology in agricultural colleges receive their inspiration and early training from Professor Comstock and his able staff of co-workers? So it came about naturally that Entomology was placed on the programme of courses, as soon as it was decided that the Graduate School would be held in 1908 at Cornell.

The task of arranging for speakers, topics and dates fell mainly on Prof. Slingerland, who also acted as chairman of each meeting. It was finally decided to have a lecture every morning (except Saturday and Sunday) from 9.30-10.30, and seminars on Tuesday and Thursday afternoons from 3 to 5. By this schedule, the horticulturists at the School were free to attend, and to benefit by the course. This arrangement was welcomed, and many of them attended every lecture.

The first week was assigned to the experts of the Bureau of Entomology at Washington. Dr. Howard gave two lectures on (1) "The Present Condition of Economic Entomology," and (2) "Recent Developments in the Practical Handling of Beneficial Parasitic Insects." Prof. A. L. Quaintance discussed the deciduous fruit investigations of the Bureau of Entomology, and led a large field party in a study of Mr. King's extensive orchards at Trumansburg. Prof. A. H. Hopkins gave one lecture on "The Work of the Bureau of Entomology Against Forest Insects," and conducted a field trip for the study of the common insects infesting trees in the vicinity of Cornell. Prof. F. M. Webster concluded the lectures of the first week by an account of the investigations of insects injurious to grain and forage crops by the Bureau of Entomology.

The second week was assigned to some of the most important Station Entomologists. Prof. P. J. Parrott of the N. Y. Agricultural Experiment Station, Geneva, gave two lectures on methods in planning and conducting co-operative experiments which were very suggestive and helpful. His seminar was devoted to a study of problems which were interesting him at the present time, viz., the pits on apple twigs and branches, made by the tree-cricket; the pits and markings on pear fruit by membracids; the leaf blister-mite in apple orchards; the willow girdler.

Prof. Slingerland described the work of an interesting plum leaf miner (*Nepticula*), and the work of Heterocordalis malinus, a bright red bug which distorts the leaves and fruit of the apple, preferably Greening and Ben Davis varieties.

Mr. Crosby described a new chalcid (*Syntomaspis druparum*) which he found infesting apple seeds.

Prof. E. D. Sanderson, Director of the Vermont Experiment Station, gave two lectures, one on the publications of the State Entomologist, and the other on methods of studying the Codling Moth, and conducted a seminar on the Codling Moth. The work of Prof. Sanderson was highly appreciated by all who took part.

Dr. E. P. Felt, New York State Entomologist at Albany, gave a lecture on the "Work and Systems in the Office of the State Entomologist," giving particular attention to the methods he adopted in indexing and cataloguing insects, experiments, and correspondence.

The third week was assigned to Dr. Forbes and Dr. Folsom of Illinois. The former in his first lecture discussed the scope of economic entomology, and emphasized the importance of the ecological phase. The Economic Entomologist should study both plant and insect ecology on account of their mutual bearings, and should keep continually before him the humanistic aspect; that is, the value of his results is to be interpreted by their ultimate good to man. Dr. Forbes' second lecture dealt with concrete examples of economic studies, which he himself had made in Illinois, viz., the Northern and the Southern corn-root-worms, the common white grubs, and the aphids of the corn plant. In the period allotted for a seminar, Dr. Forbes described his method of keeping his office records. He keeps (1) an Accession Catalogue, (2) A Species Catalogue, and (3) An Experiment Record. Dr. Folsom gave three most interesting and instructive lectures on the "Insects Injurious to the Clover Plant," and conducted a trip for the study and collection of these insects in the fields. He dealt with the following: *Clover-leaf weevil, Pea aphis, Clover-stem borer, Clover-seed Midge, Clover-seed Chalcid, Clover-seed Caterpillar, Clover-root Borer* and *Clover-hay worm.* A monograph on clover insects will be published soon by Dr. Folsom, who has devoted nearly five years to this subject.

The fourth week was assigned to the Entomological Staff of Cornell University. Prof. Slingerland devoted two lectures to insect photography, to which he has given much attention, so that he is now considered our foremost insect photographer.

Dr. J. G. Needham gave a lecture on "What Shall be Done with the Marshes?" He pointed out that while many marshes should be drained and made valuable as agricultural lands, there are other marshes that should not be drained, as they serve useful purposes, and on account of their location would never be valuable as farm lands. He urged that such areas be made places of beauty and recreation, free from the festive mosquito. Dr. Needham conducted the class to his Marsh Laboratory near Renwick Park and explained the nature of the investigations he was conducting with aquatic forms.

Drs. MacGillivray and Riley gave interesting lectures on the "Methods and Aids in Entomological Instruction." They urged the importance of careful systematic work, not only along the older lines of anatomical and systematic Entomology, but also along the newer lines of morphological and embryological investigations, if many of the problems that are now confronting the economic entomologists are to be solved successfully.

Much credit is due Prof. Slingerland for the excellent course of lectures provided, which every member of the class thoroughly enjoyed.

From the old Cornell students in attendance, the absence of Prof. and Mrs. Comstock—who were taking a well-earned holiday in Egypt and Europe—called forth many expressions of regret, for to most of them the most pleasant memories of their Cornell life are associated with Prof. and Mrs. Comstock in the Entomological Laboratories.

At the close of the proceedings a hearty vote of thanks to Dr. Felt was proposed by Prof. Lochhead, seconded by the Rev. Dr. Fyles, of Quebec, and enthusiastically adopted by the meeting. After a musical selection by the orchestra, the audience joined in singing "God save the King," and the session was brought to a close.

SECOND DAY'S SESSION—FRIDAY, NOVEMBER 6TH, 1908.

The Vice-President, Mr. Tennyson D. Jarvis, took the chair at 9.30 o'clock a.m. in the Biological lecture-room of the Ontario Agricultural College. There was a good attendance throughout the day, composed of students as well as members of the Society. The first order of the day was the reading of the reports of the Council, the Branches of the Society at Montreal by Mr. H. H. Lyman, Quebec by Rev. Dr. Fyles, and Toronto by Mr. J. B. Williams. The reports of the Treasurer, Librarian and Curator were presented by the respective officers, and that of the Delegate to the Royal Society by Mr. Arthur Gibson of Ottawa. This was followed by the election of officers for the ensuing year, 1908-9 (see page 6). Dr. Fletcher was unanimously re-elected President, and Mr. T. D. Jarvis and Dr. E. M. Walker, of Toronto, first and second Vice-President respectively; the latter appointment was made in view of the fear that Dr. Fletcher might be incapacitated from accepting any office. This apprehension proved unhappily to be well-grounded; our reverend and beloved friend died two days later—an account of his life and fatal illness will be found in another part of this report. At a subsequent meeting of the Society held on November the 18th, Mr. Jarvis was elected President and Dr. Walker, Vice-President.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present the report for 1907-8.

The forty-fourth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on October 31st and November 1st. Many members from a distance, almost all of the local members and a considerable number of interested outsiders, including many of the students of the College, were present.

The first afternoon was devoted to a conference on Fruit-tree Insects. The chief insects discussed were the Fruit-tree Bark Beetle or Shot-hole Borer, which had been doing much damage to Cherry trees in the Niagara district during the season, Codling Worm, Oyster-shell, Terrapin and San José scales, and the Woolly Aphis. This discussion was followed by the "Reports on Insects of the Year" by the directors from their respective divisions of Ontario. In the evening the president, Dr. Fletcher, delivered his inaugural address entitled "The Entomological Outlook." This was followed by a very interesting and instructive illustrated lecture by Mr. A. H. Kirkland of Boston, Mass., on "The Gypsy and Brown-tail Moths in Massachusetts." The morning and evening of the second day were occupied with the reading of reports from the branches and officers of the Society and a series of scientific and practical papers on various subjects. In the evening session Dr. E. M. Walker of Toronto University gave an illustrated lecture on "Collecting and Rearing Dragon Flies at the Georgian Bay Biological Station." All of these papers and addresses have been published in the annual volume.

This volume, the 38th Annual Report to the Legislature of Ontario, was published early in March, and contained 136 pages, and four excellent half-tone plates of Galls from a variety of plants. Besides the papers already mentioned it included the following articles: "Voices of the Night," by Dr. Fyles; "A Preliminary List of the Scale Insects of Otnario," by Mr. T. D. Jarvis; "The Lime-Sulphur Wash," by Mr. L. Caesar; "An Unusual Outbreak of Halisidota Caterpillars," by Mr. A. Gibson; "Additional Insect Galls of Ontario," by Mr. T. D. Jarvis; "Injurious Insects in Ontario in 1907," by Dr. Bethune; "A Remarkable Outbreak of the Variegated Cutworm," by Dr. Bethune and Mr. L. Caesar; "Two-winged Flies," by Dr. Fyles; "A Report of the Summer Meeting," by the Secretary; and "The Entomological Record," by Dr. Fletcher and Mr. A. Gibson.

"The Canadian Entomologist," the monthly magazine of the Society, has been regularly issued at the beginning of each month. The 39th annual volume was completed in December last and eleven numbers of the 40th volume have already been published.

The volume for 1907 consisted of 423 pages and was illustrated with eleven full-page plates and a number of figures from original drawings. The contributors were 73 in number and included writers in Ontario, Quebec, Manitoba, Alberta, British Columbia, the United States, Cuba, Jamaica, the Hawaiian Islands and England. The articles are for the most part of a scientific character and contain, among much highly valuable matter, descriptions of eleven new genera and 222 new species and varieties of insects belonging to various orders. There is also a series of articles by different authors on subjects included under the title of "Practical and Popular Entomology." The material contained in the volumes of our magazine is so indispensible to specialists in all departments of Entomology that there is a steadily increasing demand for volumes and numbers, and occasionally for complete sets.

The reports from the Branches of the Society at Montreal, Quebec, Toronto and British Columbia are very satisfactory, meetings having been regularly held and many papers read and discussed. The Bulletin published quarterly by the British Columbia Society contains lists of local insects and many notes and observations of a highly interesting character.

From October to the third week in March meetings of the Society have been held every alternate Wednesday evening in the Biological lecture-room of the Ontario Agricultural College at Guelph. The attendance throughout has been satisfactory and a gratifying amount of enthusiasm has been shown by the members throughout the year. The following is a list of the papers read at the meetings: "The Cynipid Galls," by Mr. W. R. Thompson; "The Fight against the Brown-tail Moth in Nova Scotia," by Mr. T. Brady; "Wing Classification of the Heteropterous Land Forms," by Mr. R. C. Treherne; "Parasitism," by Mr. G. M. Frier; "Adaptions of Aquatic Insects," by Mr. L. Caesar; "Fungi that attack Insects," by Mr. J. W. Eastham; "Insects as carriers of Disease," by Mr. T. D. Jarvis; "Reminisscences of Entomologists whom I have known," by Dr. Bethune.

It is with deep regret that the Council records the death in his 67th year of Mr. John A. Balkwill, Director for the London District, and for several years the efficient Treasurer of the Society, which took place at his residence in London on the 10th of October, after a few weeks' illness. While much interested in Entomology, he was particularly devoted to Botany and Horticulture, and was familiar with all the wild plants in the neighborhood of London. He was the first President of the local Horticultural Society and continued to be an active member of its directorate, taking a leading part in its annual floral exhibitions and in the general improvement of the parks, boulevards and gardens of the city. The members of the Council beg to offer to his widow and family their respectful sympathy in the bereavement that they have sustained.

The Council has also to lament the death of one of the Honorary Members of the Society, Dr. William H. Ashmead, which took place on the 17th of October. For nearly thirty years he was a constant and valued contributor to the pages of the "Canadian Entomologist" and had attained a high reputation among all students of this department of science from the thoroughness of his work. He had devoted himself especially to the study of the Hymenoptera and became the chief authority on the order in North America. His death at the early age of 53 years is a distinct loss to science and leaves a gap that it will not be easy to fill.

Respectfully submitted,

TENNYSON D. JARVIS,
Vice-President.

ANNUAL REPORT OF THE MONTREAL BRANCH.

The 294th regular, and 35th annual meeting of the Montreal Branch was held in the rooms of the Natural History Society, Drummond Street, on Saturday evening, May 16th, 1908.

Members present: Messrs. Geo. A. Moore in the Chair; Henry H. Lyman, E. C. Barwick, G. Chagnon, A. E. Norris, A. F. Winn.

The Secretary read the following report of the Council.

During the season 1907-08 meetings have been held monthly except in July and August, making ten in all, the average attendance being 7½, and two meetings of the Council have been held. The papers read at the meetings were as follows:—

Annual Address of President, Geo. A. Moore.
Hemiptera taken at St. Madeleine, Quebec, May 24, Geo. A. Moore.
Notes on Coleoptera taken at St. Madeleine, G. Chagnon.
An Afternoon at Highgate Springs, Vt., A. F. Winn.
Canadian Cerambycidæ, 1907, G. Chagnon.
Sugaring Record—August, 1907, A. F. Winn.
Hemiperta taken at Lacolle, Quebec, July 19-31, G. A. Moore.
Report on Boston Meeting Ent. Soc. of America, and Work on Browntail and Gypsy Moths, Henry H. Lyman.
A Field of Golden-rod, A. F. Winn.
Notes on collecting Sthenopis thule, E. Denny.
Note on Sphinx Canadensis, E. C. Barwick.
Variations in shade of Samia cecropia, E. Kollmar.
On the Oriental Moth, Henry H. Lyman.
An Account of the Annual Meeting at Guelph, Henry H. Lyman.
Plusia precationis at Petunia blossoms, A. F. Winn.
Further Notes on Hepialus thule, Henry H. Lyman.
Larval habits of Pyrausta theseusalis, walk, G. Chagnon.
An odd Home for a Micro Larva, A. F. Winn.
Another Fortnight at Biddeford, Me., A. F. Winn.
Notes on Hemiptera taken at Biddeford, Me., Geo. A. Moore.
Collecting and breeding Notes for 1907, Henry H. Lyman.
A few remarks on the Season's Work, E. Denny.

My best Captures for 1907, G. Chagnon.

Notes on the Season 1907, A. F. Winn.

On the attraction of Male Moths to bred females, E. C. Barwick.

Notes on the English Season 1907, L. Gibb.

Habits of Insects as a Factor in Classification, Prof. H. Osborne, (selected) read by Mr. Lyman.

A Trip to Chicago and Decatur, Ill., Henry H. Lyman.

Type and Typical, Henry H. Lyman.

Our Meetings—a Statistical Review, Henry H. Lyman.

Evolution of a Locality Label, A. F. Winn.

North American Species of Monohammus, G. Chagnon.

A little Journey to the Home of Mr. E. P. Van Duzee, G. A. Moore.

Entomological Reminiscences, Henry H. Lyman.

While the average attendance at the meetings is smaller than might be hoped for, it is gratifying to your Council to be able to state, that not only has the work of contributing papers been shared among the members, but also that the total of 34 papers is the largest number for any year in the history of the Branch. During the year we have added four names to our roll, but we have lost from our active list—for the time being—Mr. G. R. Southee, whose business position has necessitated his removal to Calgary, Alta. However, we feel sure he will favor us from time to time with accounts of his work among the butterflies and moths of that vicinity. We had the pleasure of having Mr. C. H. Young of Ottawa at our October meeting.

One field day was held at St. Madeleine, Quebec, on May 24th, but weather conditions were very unfavorable.

The collection of photographs of members has been added to by the presentation of a portrait of the late Mr. Robert Jack.

In the library have been placed copies of the current numbers of the Canadian Entomologist, the annual report of the Parent Society for 1907, report of the South London Entomological Society, 1907, Dr. Fletcher's "Weed book," the N. Y. State Entomological publication and the Plates of Wright's Butterflies of the west coast.

The Curator's duties have not been made arduous by the addition of any new specimens, but the collection is in good condition, and any duplicates the members can spare will be very acceptable. The Treasurer presented a statement showing a balance on hand of $65.35.

The following officers were elected: President, Geo. A. Moore; Vice-President, Henry H. Lyman; Secretary-Treasurer, A. F. Winn; Curator and Librarian, L. Gibb; Council, E. C. Barwick, G. Chagnon and E. Kollmar.

ALBERT F. WINN, *Secretary-Treasurer.*

REPORT OF THE QUEBEC BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The season of 1908 has been a very remarkable one. We have had a long continuance of fine weather and a great lack of rain. The long drought dried the leaves on the trees and they began to fall before the frosts came.

There have been destructive forest fires all around us, and the air has been full of smoke—at times so dense as seriously to impede navigation.

In consequence, there have been but few insects on the wing, but Mrs. Turner took a lovely specimen of *Hyphoraia parthenos*, Harris, at her summer residence on the Island of Orleans. Mr. Boulton captured several interesting specimens on the same island, amongst them one of *Phycanassa viator*, Edw. This insect is rare in our locality.

We are greatly indebted to Miss Freeman for several valuable donations for our cabinet, of choice specimens from the South and West of America.

We have heard with deep concern of the serious illness of J. H. Simmons, Esq., a member of our council. Many earnest prayers are offered on his behalf.

The Rev. Dr. Fyles has retired from the position of chaplain at Quebec for the S.P.C.K., and intends to move from this neighbourhood shortly. He has therefore felt called upon to present his resignation of the office of president of the Branch. He has done so with regret. The loss of his valuable services will be greatly felt by the members of the Branch whose best wishes accompany him to his new home.

(Signed) R. A. M. Boulton,
President.

Crawford Lindsay,
Sec.-Treasurer.

Report of Council.

The Branch now numbers 29 members.

The secretary-treasurer's report will be submitted to you.

During the year papers were read on the following subjects:—

By the President, Rev. Dr. Fyles: "Two-winged Flies," "Variations in Insects," "Southern Hawk Moths," "Form and habits of the mole cricket."

By Mr. R. A. M. Boulton: "Moths collected by the electric light at Montmorenci Falls," "Buterflies of the New Forest, England."

The thanks of the Branch are due to the authorities of Morrin College for allowing the members the use of their rooms.

(Signed) Crawford Lindsay,
Sec.-Treasurer.

At the annual meeting held on the 24th October, 1908, the officers for the coming year were elected as follows:—

Honorary President: Hon. R. Turner, M.L.C.
President: Mr. R. A. M. Boulton.
Vice-President: Mrs. R. Turner.
Secretary-Treasurer: Lt.-Col. Crawford Lindsay.
Council: J. H. Simmons, Esq., James Geggie, Esq., Miss Bickell, Miss Freeman, Miss Hedge.

(Signed) Crawford Lindsay,
Sec.-Treasurer.

REPORT OF THE TORONTO BRANCH OF THE ENTOMOLOGICAL SOCIETY FOR 1907-8.

The twelfth annual meeting of the Society was held on Tuesday, May 26, 1908, in the Provincial Museum, St. James' Square.

The President, Dr. Brodie was in the chair, and the following members were present:—Mr. Coleman, Mr. Webb, Mr. Williams, Mr. Woods, Miss Blackmore, Dr. Abbott.

The following officers were elected for 1908-9:—

President: Dr. Brodie.
Vice-President: Dr. Walker.
Secretary-Treasurer: Mr. Laing.
Librarian: Mr. Williams.
Curator: Mr. Laing.
Council: Mr. Woods, Mr. Webb, Mr. Ivey, Dr. Abbott.

During the past year 12 meetings were held with an average attendance of 8. The Society also spent a day at Niagara Glen which was both profitable and enjoyable.

The membership of the Society has increased to 30. As a number were comparatively young in the study of Entomology, an effort was made during the past winter to study the orders systematically. A committee for identification was also formed so that members might have some assistance in identifying their specimens. The study of Botany, in so far as it relates to the life history of insects, has also been introduced.

The work of making as complete a record as possible of the fauna and flora of Niagara Glen has also been proceeded with and reports from several members have been made.

The subject of Insect Mimicry has received much attention, and discussion, as the list of papers appended will show.

The treasurer's report shows the finances to be in a satisfactory condition with a balance in hand of $4.51.

LIST OF PAPERS READ.

Characteristics of the Order Orthoptera—Dr. Walker.
Defence of Theory of Mimicry—Dr. Walker.
Insect Mimicry and Evolution—Dr. Brodie.
The Order Lepidoptera—Mr. Williams.
Arrangement of Insects according to habit—Dr. Brodie.
Interior of Africa—Mr. Thurston.
Galls—Mr. Cosens.
Relation of Plants to Insects—Mr. Ivey.
Aquatic Hemiptera—Dr. Walker.

Respectfully submitted,

E. BLACKMORE,
Sec.-Treasurer.

FINANCIAL STATEMENT.

Of the Entomological Society of Ontario made to the Department of Agriculture for the Province of Ontario for the year ending August 31st, 1908.

RECEIPTS.

Cash on hand from previous year as per last report	$640 73
Members' fees and subscriptions to "The Entomologist"	402 31
Sales of cork, pins, etc.	68 49
Sales of back numbers of "Entomologist"	121 70
Advertisements in "The Entomologist"	52 75
Government grant	1,000 00
Interest on bank deposits	11 28
Printing—Sale of extra pages, cuts, etc.	32 20
Expenses—Return of postage by Government, etc.	10 41
Total	$2,339 87

EXPENDITURES.

Supplies of pins, cork, etc.	$51 67
Back volumes	2 00
Fees remitted	5 11
Printing	869 02
Expenses—Postage, express, etc.	47 42
Annual meeting	109 31
Library	11 31
Annual report	114 29
Salaries	300 00
Honorarium—Dr. Bethune for services in moving headquarters	50 00
Total	$1,560 13
Balance on hand August 31st, 1908	$779 74

Examined and found correct this 5th day of November, 1908.

J. W. EASTHAM, } Auditors.
J. W. CROW, }

STATEMENT OF ASSETS AND LIABILITIES.

ASSETS.

Cash in bank	$779 74
Books and magazines in library	2,500 00
Museum	1,600 00
Wood cuts, plates, electros, etc.	700 00
Office furniture	75 00
Back numbers of the Canadian Entomologist and annual reports	850 00
Microscopes	225 00
	$6,729 74

LIABILITIES.

Nil.

S. B. MCCREADY,
Treasurer.

CURATOR'S REPORT.

During the past year, as in previous years, the curator's work has been chiefly the general care and supervision of the Society's collections and the recording and placing of new specimens received from members of the Society. Last year lists of the species especially desired for the Society's collections were prepared and sent out to some of the members. These lists were long and contained many common species and gave the idea to some of the members who received them that the Society's collections were far from being representative of the fauna of Canada. This, however, is not the case as nearly all the common species appearing in the lists are in the Society's collections but many of them lack date and locality labels, and some of them are old and imperfect specimens. Thus they were included in the lists in the hope that in time all the common species might be represented in the Society's cabinets by perfect specimens bearing date and locality labels.

Since the last report the following contributions have been received and our sincerest thanks are due to the generous contributors for the same: 6 specimens of Coleoptera, by A. Gibson, Ottawa; 2 specimens of Lepidoptera, by James Fletcher, Ottawa; over 200 specimens of Lepidoptera, by Mr. F. H. Wolley Dod, of Millarville, Alberta; 50 specimens of Lepidoptera, by Mr. Charles R. Ely, of Washington, D.C.; 87 specimens of Cuban Lepidoptera, by Mr. Charles T. Ramsden, Guantanamo, Cuba.

In conclusion, the curator begs to remind the members of the Society that specimens, especially of rare and new species, are always most acceptable, and help to make the Society's collections more representative and of more value to every member of the Society.

Respectfully submitted,

J. E. Howitt,
Curator.

REPORT OF THE LIBRARIAN.

During the year ending August 31st, 1908, forty-nine bound volumes have been added to the Library, making the total number on the register 1,971; also a very large number of periodicals, pamphlets and bulletins, many of which will be bound during the next few months. Among the new books may be mentioned the English reprint by Mr. P. Wytsman, of Brussels, of Hubner's Sammlung Exotischer Schmetterlinge (*Lepidoptera Exotica*), edited by Mr. W. F. Kirby, of the British Museum; this work, which has been issued in parts during the last fourteen years and is now completed, forms three large quarto volumes and contains 491 hand-coloured plates of Lepidoptera, carefully copied from the originals, together with notes by the Editor on all the species depicted. The Farm Weeds of Canada, by Dr. Fletcher, with coloured illustrations of a large number of species, is another noteworthy addition to the useful books in the library. Thirty-eight volumes have been taken out by members during the year, but this does not at all indicate the use that has been made of our books as they are being consulted almost daily by students and members of the Society.

Respectfully submitted,

Charles J. S. Bethune, *Librarian.*

REPORT TO THE ROYAL SOCIETY OF CANADA.

By Arthur Gibson, Ottawa.

As delegate from the Entomological Society of Ontario, I have the honour of presenting the following report of the work of the Society during the past year.

The annual meeting of the Society was held on October 31st and November 1st last, at the Ontario Agricultural College, Guelph, the headquarters of the Society. This meeting was a most successful one and a large number of prominent entomologists and others were in attendance during the two days' session. A feature of the annual meeting of this Society is the reception and discussion of the reports of the directors of the six Districts in Ontario into which the economic work of the society is divided. In these reports mention is made of the insects which have been particularly destructive during the season. The annual report of the Society appeared in March last and in this an account of the proceedings of the above meeting are given, as well as most of the papers which were presented at the sessions. Among these latter the following may be mentioned:

"The Entomological Outlook" (Presidential Address). By Dr. J. Fletcher.

"The Gypsy and Brown-tail Moths in Massachusetts." By Mr. A. H. Kirkland.

"Voices of the Night." By Rev. Thos. Fyles.

"Collecting and Rearing Dragon-flies at the Georgian Bay Biological Station." By Dr. E. M. Walker.

"A Preliminary List of the Scale Insects of Ontario." By Mr. T. D. Jarvis.

"The Lime-Sulphur Wash." By Mr. L. Caesar.

"An Unusual Outbreak of Halisidota Caterpillars." By Mr. Arthur Gibson.

"Additional Insect Galls of Ontario." By Mr. T. D. Jarvis.

"Injurious Insects in Ontario in 1907." By Rev. Prof. Bethune.

"Entomological Record, 1907." By Dr. James Fletcher and Mr. Arthur Gibson.

During the year the Society also held a summer meeting at the Ontario Agricultural College, on July 4 and 5, when interesting papers were presented by Mr. H. H. Lyman on "Thecla calanus and edwardsii"; Mr. C. W. Nash on "Balance in Nature"; Dr. Henry Skinner on "Insects as Carriers of Diseases"; Dr. J. Fletcher on "Nature Study as a Means of Education"; Dr. W. Brodie on "The Life-history of a Colony of the Tent Caterpillar," and Mr. C. W. Nash on "Instinct *vs*. Education." An excursion was also held to Puslinch Lake, about nine miles from the college, many specimens of interest being collected.

The Branches of the Society at Quebec, Montreal, Toronto, Guelph and Vancouver, have all been actively at work during 1907, and much useful work in entomology is being thus encouraged at all of these centres. Regular meetings during the winter have been held by all of these Branches of the Society and many interesting papers have been presented and discussed.

During the year 22 bound volumes have been added to the Society's library at Guelph, besides a large number of periodicals, bulletins and pamphlets. Many of these latter are being bound up into permanent volumes.

This library which is one of the most complete entomological libraries in America is continually being used by members of the Society and by students specializing in entomology at the Ontario Agricultural College.

The collections of insects belonging to the Society have been materially added to during the year and considerable work has been done in going through the cabinets and rearranging the specimens.

The Canadian Entomologist, which is published by the Society, is now in its 40th volume. Volume XXXIX, which ended with the December, 1907, number comprised 423 pages, with 11 full page plates and 23 figures in the text. No less than 73 different entomologists contributed to the volume, and 11 new genera, 216 new species and 5 new varieties are described.

These papers are of a high character and in a report like this it is impossible to mention very many of them. Some of the more important, however, are. "New Micro-lepidoptera," by Mr. W. D. Kearfott; "New species of North American Lepidoptera," by Dr. W. Barnes; "Notes on Chalcolepidius and the Zopherini," by Major Thos. L. Casey; "On the Classification of the Mosquitoes," by Dr. Harrison G. Dyar and Mr. Frederick Knab; "A New Somatochlora, with a Note on the Species known from Ontario," by Dr. E. M. Walker; "Habits of some Manitoba 'Tiger Beetles' (*Cicindela*)," by Mr. Norman Criddle; "Studies in the Genus Incisalia," by Mr. John H. Cook; "The Eupitheciae of Eastern North America," by Rev. G. W. Taylor; "List of Hemiptera taken at Como, Quebec," by Mr. G. A. Moore; "The Classification of the Culicidae," by Miss Evelyn Groesbeeck Mitchell; "The Stridulation of the Snowy Tree-cricket (*Œcanthus niveus*)," by Mr. A. Franklin Shull; "New Coleoptera from the Southwest," by Mr. H. C. Fall; Tenthredinidae of Colorado," by Mr. Geo. P. Weldon; "New Tropical American Hesperidae," by Mr. Geo. A. Ehrmann; "Perlidæ from British Columbia and Alberta," by Mr. Nathan Banks; "*Diplonychus*, Laporte (—*Hydrocyrius*, Spinola), and its Relation to the other Belostomatid Genera," by Mr. J. R. de la Torre Bueno; "New species of Colorado Aphididæ, with Notes upon their life-habits," by Prof. C. P. Gillette: "Further Notes on the Occurrence of Hepialus thule, Strecker, at Montreal," by Mr. H. H. Lyman.

Besides the above technical papers, the following appeared under the heading "Practical and Popular Entomology":

"How Insects are Distributed." By Mr. L. Caesar.

"A Homemade and Effective Insect Trap." By Mr. John D. Evans.

"The Scolytidae or Engraver-Beetles." By Mr. J. W. Swaine.

"The Walking-Stick Insect" (*Diapheromera femorata*). By Mr. J. B. Williams.

"Fumigation with Hydrocyanic Acid Gas for Beginners." By Prof. Glenn W. Herrick.

The Society now has 185 Canadian members. The Canadian Entomologist is sent out to 486 subscribers each month as it is issued. Besides the subscribers there are on the Exchange List, the names of 112 Societies, etc., which receive the Canadian Entomologist regularly.

THE ECONOMIC IMPORTANCE AND FOOD HABITS OF AMERICAN GALL MIDGES.

By E. P. Felt, Albany, N.Y.

The extensive and frequently severe depredations of the Hessian-fly, *Mayetiola destructor*, Say, are too well known to require extended notice in this connection, and the same is also true, though perhaps in a more limited sense, of the Wheat Midge, *Cecidomyia tritici*, Kirby. The genus Contarinia appears to be a very important one to the economic entomologist. It contains the somewhat well known Pear Midge, *Contarinia pyrivora*, Riley, a species which has been responsible in recent years for the destruction of considerable fruit in Connecticut, New York, New Jersey and presumably in adjacent states. A more recently discovered species is known as the Violet Midge, *Contarinia violicola*, Coq., a form which has proved a serious enemy of the extensive violet growing industry located in and about Rhinebeck, N.Y., and one that bids fair to cause more injury in the future unless growers are very careful to avoid conditions favorable for its multiplication. The Sorghum Midge, *Contarinia sorghicola*, Coq., another recent discovery, breeds in sorghum seed and, in recent records, has been credited with causing the common failure of this plant to produce a full crop of seed. A still later note states that this insect destroys all sorghum seed in Texas south of a certain line. The Cotton Midge, *Contarinia gossypii*, Felt, is a species of some economic importance, since it has been reported as injurious to cotton in the British West Indies. Still another form, *Contarinia negundifolia*, Felt, was reared from the leaves of a box elder and is possibly identical with the *Cecidomyia negundinis*, Gill., a species which has been recorded as decidedly injurious to its host plant on the college campus at Ames, Iowa.

There have been several other injuries by Cecidomyiidæ brought to notice recently. One of these is the extensive destruction of linden buds by a form which we have been unable to rear as yet. This insect was so abundant at Rhinecliff, N.Y., as to destroy from 50 to 75 per cent. of the buds on large trees, causing the death of numerous twigs and of a few large branches. Similar injury to young Catalpa trees has recently been recorded by Prof. Gossard and is probably due to the work of *Cecidomyia catalpæ*, Comst. Several years ago a small proportion of the grape blossoms in the Chautauqua grape belt were found infested by Cecidomyiid larvæ. This last season the insect, *Cecidomyia Johnsoni*, Sling., was so abundant in an acre of Moore's early grapes near Fredonia, as to destroy from 60 to 75 per cent. of the crop. Observations have shown this pest to be generally distributed throughout the grape belt, and it is very probable that some other mysterious failures of the crop were due to the work of this insect. A number of species are known to live in the buds of plants, and it is presumable that other bud-inhabiting forms, aside from those mentioned above, have caused or are able to cause serious losses. It is certain that members of the Cecidomyiidæ are capable of inflicting grave injury, and no scientist can state that any one species might not become destructive in the near future. More knowledge respecting this group is necessary before its economic status can be accurately fixed.

It is gratifying to state that some species of Cecidomyiidæ at least, are distinctly beneficial. The members of the genus *Aphidoletes*, Kieff., live at the expense of aphids, and are therefore beneficial. One species, *A.*

meridionalis, Felt, was reared a number of years ago from *Siphonophora liriodendri*. *Aphidoletes cucumeris*, Lintn., undoubtedly preys upon the melon louse, *Aphis gossypii*, Glov., though when it was described by the late Dr. Lintner as a *Diplosis*, it was supposed to be responsible for a bud gall. Another species of *Aphidoletes*, bred from the melon aphis and probably *A. marina*, Felt, was recently received from Prof. C. P. Gillette of Colorado, accompanied by the statement that it was particularly destructive to plant lice in the Insectary and was not uncommon out of doors, attacking different species of plant lice. The genus *Mycodiplosis*, Rubs., is zoophagous and it is gratifying to note that *M. acarivora*, Felt, preys upon the red spider infesting the Citrus trees of California.

The above is sufficient to show that the food habits of this group are of interest to the economic entomologist. We now propose to gvie some brief notes respecting the habits of various members of this family. The Campylomyzariæ include a considerable number of forms most frequently found in forests or in association with decaying vegetable matter. The very characteristic genus *Joanissia*, Kieff., presumably breeds in decaying vegetable matter, since Kieffer records rearing several species from decaying wood, tufts of moss and mold covering a fungus. Members of the genus *Campylomyza*, Meig., are rather common in woodlands. One species, *C. lignivora*, Felt, was reared in considerable numbers from the fungous affected heart wood of pine. The long, yellowish larvæ evidently eroded the tissues to a considerable extent, as the cavities inhabited by them were more or less filled with extremely fine wood flour. *C. pinicorticis*, Felt, was bred from galleries of a *Scolytid* in pine. *Campylomyza coprophila*, Felt, was obtained from manure, while *C. dilatata*, Felt, was reared from a vial containing elm seeds and debris. One species, *Campylomyza pomifloræ*, Felt, occurs commonly in early spring about blossoms of cherry and shadbush. The peculiar *Miastor americana*, Felt, was taken on either beech or chestnut leaves. Several species of *Brachyneura*, Rond., have been reared, *B. eupatorii*, Felt, being obtained presumably from an oval swelling on the stem of thoroughwort *Eupatorium perfoliatum*, and another, *B. vitis*, Felt, was reared from a jar containing the familiar *Lasioptera vitis*, O. S., gall on grape.

The Lasiopterariæ is a very characteristic group, the members of which appear to invariably undergo their final transformations within the tissues of the host plant. The peculiar *Clinorhyncha* seems to be restricted to the blossoms of certain compositæ, since *C. millefolii*, Wachtl., occurs in apparently normal florets of Yarrow, *Achillea millefolium*, while *C. eupatori-floræ*, Felt, may be obtained from similar flowers of thoroughwort *Eupatorium perfoliatum*. *Baldratia*, Kieff., is another exceedingly interesting genus, since most of its species breed in the peculiar, apparently fungous affected blister galls so common on aster and solidago. The sixteen species reared are divided about equally between species of aster and solidago. A few forms have been obtained from comparatively normal leaf tissues, and one interesting species bred from small, oval galls on aster leaves recognized simply by a slight elevation on the under surface. Members of the genus *Lasioptera* and *Neolasioptera* occur almost exclusively in stem galls on herbaceous plants and in subcortical galls on woody plants. The irregular eccentric stem gall of *Lasioptera tumifica*, Beutm., on solidago is an excellent type of one form of gall, while the irregular subcortical gall on Cornus, made by *Neolasioptera cornicola*, Beutm., illustrates the other. The species of both genera winter, so far as known, within the gall, those inhabiting herbaceous plants usually appearing in rather early spring, while certain of the forms occurring in woody tissues do not emerge till June.

Representatives of the genus *Dasyneura* exhibit a marked preference for leaf folds, leaf buds or loose leaf bud galls. *Dasyneura anemone*, Felt, occurs in a loose apical bud of *Anemone canadensis*, while *D. clematidis*, Felt, inhabits an oval stem gall. The genus *Rhabdophaga*, as we understand it, exhibits a marked partiality for the willow, breeding for the most part in bud galls or woody tissues. Some eighteen species are known to inhabit this plant.

The Oligotrophiariæ is best represented by the genus *Rhopalomyia*, which latter displays a very marked preference for solidago, fifteen species occurring on this plant and subsisting at the expense of the flowers, the leaves, the stems, or even on portions of the underground root stocks. The species are easily reared and, so far as we have been able to determine, each is responsible for a peculiar type of gall. Six species of *Mayetiola* have been reared from willow, *M. walshii*, Felt, producing an apical rosette gall, *M. rigidæ*, O. S., forming a characteristic apical beak gall, while the other species occur in woody tissues.

The Asphondyliariæ is a very well marked group exhibiting considerable similarity in habit. The typical genus *Asphondylia* may well be represented by the common *A. monacha*, O. S., a species which breeds in both solidago and aster. It has been reared from apparently unaffected blossoms of plants belonging to both genera. It occurs in small rosette galls on the narrow-leaved solidago, *Euthamia lanceolata*, and has been reared from what we have designated as the adherent leaf gall on *Solidago canadensis* and *S. serotina*. This latter gall is simply an oval cell formed by two leaves adhering at the margin of the cavity. Most of the species of *Asphondylia* occur in bud galls, and it is probable that some forms are injurious. The allied *Schizomyia* likewise breeds in bud galls or may be responsible for modifications of the same such as the hard, nut-like, polythalamous gall of *Schizomyia pomum*, Walsh, much better known as *Cecidomyia vitis-pomum*. A large, oval or fusiform petiole or tendril gall is made by *S. petiolicola*, Felt. The genus *Cincticornia* is also included in this group and breeds, so far as known, in leaf galls. *Cincticornia caryæ*, Felt, was reared from a conical leaf gall on hickory, while *C. pilulæ*, Walsh, better known under the name of *Cecidomyia*, inhabits the common reddish, ovate hard leaf gall on oak.

The Diplosariæ includes a large number of forms most easily recognized by the two swellings on each antennal segment in the male. Practically nothing is known concerning the life history of the larger, heavier forms of *Hormomyia*, though some of the smaller, lighter forms have been reared, such as *H. caryæ*, O. S., and *H. holotricha*, O. S., both better known under the name of *Cecidomyiæ*. *H. cratægifolia*, Felt, has been reared from a cocks-comb gall on Cratægus leaves. *Cecidomyia resinicola*, O. S., is interesting because the larvæ occur in pitch masses. Many species belonging to this group may be bred from buds or leaves and a few, as mentioned in the preceding economic discussion, from seeds. We have reared a number of species of *Mycodiplosis* and particularly of *Lestodiplosis* from various leaf galls. The habits of these species are not sufficiently well known so that we feel certain that in every instance we have secured the form responsible for the deformity. There is still need of much life history work in this group before certain puzzles as to relationships and food habits can be satisfactorily solved.

Comparatively little is known concerning the food habits of our Epidosariæ. *Asynapta saliciperda*, Felt, has been reared from old, dried *Rhabdophaga batatas*, Walsh, galls, while *Winnertzia pinicorticis*, Felt, was bred from under the bark of *Pinus inops*. This group presents great structural variations and it is to be expected that further investigations will disclose considerable variation in habits.

The Cecidomyiidæ show some exceedingly interesting preferences in the selection of food plants. For example, 39 species have been reared from solidago, 15 of these belonging to the genus *Rhopalomyia;* 28 species have been bred from Salix, 16 from aster and 10 from grape. *Lasioptera* exhibits a marked partiality for aster and solidago. The latter is also a prime favorite with *Rhopalomyia*. The genus *Rhabdophaga* occurs mostly in *Salix* and a number of species of *Mayetiola* also live upon this plant. The species of *Asphondylia*, probably because of their inhabiting buds, do not display a marked preference for any food plant. The Asphondylid genus *Cincticornia* is found largely in leaf galls on Quercus, while the smaller forms of Hormomyia are equally partial to various hickory leaf galls. The statistics just given are based upon rearings of over 300 species. The data presented can not be regarded as conclusive because most of the rearings have naturally been made from plants most easily secured or from which insects were most readily bred. Some idea of the extent and complexity of this work may be gained when it is remembered that we now know some 700 North American species, representing about 50 genera.

After some remarks upon the paper by the Chairman, a discussion arose respecting the nomenclature of galls and the insects that produce them, which was participated in by Messrs. Jarvis and Nash and Drs. Felt and Bethune. The conclusion arrived at was that names employed to designate botanical structure alone should not necessarily be attached to zoological species, that is to say that a name given to a gall with a description of the gall only and perhaps also of the larva found in it should not hold in entomology; that the only specific names to be recognized should be based upon the description of the adult perfect insect. Otherwise it was felt that great confusion must sooner or later arise.

Mr. W. R. Thompson, of the Ontario Agricultural College, Guelph, gave an interesting account of the work now being carried on in Massachusetts for the rearing of native and imported parasites of the Gypsy and Brown-tail Moths. He was engaged during the summer months as an assistant to Mr. C. H. T. Townsend, who is in charge of the parasitic work, especially as regards the Dipterous family Tachinidæ. Mr. Thompson described fully and clearly the various operations carried on in connection with the importation of nests of Brown-tail Moth caterpillars, predaceous beetles, etc.; and the methods employed in rearing the larvæ and obtaining the parasites on their emergence from the host caterpillars. He also explained some of the apparatus used by means of drawings on the blackboard. His narration was listened to with much attention and gave those present an excellent idea of this notable experiment in economic Entomology. As Dr. Howard, who is in charge of the whole work, sent a paper on this subject, which was read at the evening session, Mr. Thompson preferred that his descriptions should not be published.

OBSERVATIONS ON THE SORGHUM MIDGE.

BY R. C. TREHERNE, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Before commencing the discussion of my subject, I should like it understood at the outset that the observations recorded have not yet been confirmed by repetition, and, no doubt, therefore, some of them may not be entirely correct. The first study of the life-history of any insect is apt to be wrong in many respects, as we find, for instance, was the case with the first published statements made at the beginning of the Mexican Cotton-boll Weevil investigations, I purpose, therefore, to give a mere outline of such observations on the life-history, distribution and habits of the Sorghum Midge as came under my notice during this summer of 1908, and crave indulgence for the apparently inconclusive form of some of my records. Again I ask you to bear in mind that the work was undertaken by a student, the result of whose work still awaits proof.

Sorghum is grown in Louisiana in comparatively small areas, nearly every plantation, however, possessing a patch which rarely exceeds half an acre in size. General, therefore, as the growing of this crop would seem to be, it has for a considerable time been regarded as one which did not mature its seed. Investigations into the cause of this non-maturity did not greatly exercise the minds of the planters for the reason that the crop was not grown for its seed production, but was grown rather for green feed and for the manufacture of molasses. General theories were advanced as to the cause of this non-fruitage, but the attacks of the Sorghum Midge on the ovaries of the sorghum plant now seem to be the most potent and the main cause as yet determined. Yet it would be incorrect to say that the failure of sorghum to mature its seed in Louisiana was entirely due to the work of this midge, for the reason that the Sugar-cane Borer, *Diatræa saccharalis*, F., the moth *Nigretia sorghiella*, Riley, the Sorghum Smuts, the English Sparrows and I have no doubt yet other destructive agencies, are all means which help to prevent the sorghum crop from maturing its seed in the South.

So far as we know, this insect was first mentioned and described by Professor D. W. Coquillet in Bulletin 18, N. S. Bureau of Entomology, on "A Cecidomyiid Injurious to the Seeds of Sorghum." His description was taken from some specimens sent from Alabama in 1895. The midge seems not to have attracted further attention until 1907, when Mr. C. R. Ball, of the U. S. Department of Agriculture made a number of observations on its destructiveness in Louisiana. During this summer of 1908, systematic investigations on the life-history and habits of this midge, were begun, with the result that Professor F. M. Webster, who has the matter in hand, possesses considerable data to verify and to resume work on, if so desired, at an early date next year.

With the adult flies of this species, the two sexes are of practically the same dimensions, the females, however, on a superficial examination, appearing, on account of their length of ovipositor and somewhat plump abdomens, to be the larger. The abdomens of both sexes are brick red in general color, while their heads and thoraxes present black indications. The antennæ of the males are considerably longer than those of the females and it is by this characteristic that the two sexes are most easily recognized. The females are somewhat more sluggish in their movements than the males. The males, on the other hand, are the more active and are usually seen on the wing hovering around the heads of sorghum in the early morning, evidently awaiting the emergence of the females. The total length of the life of the female is about 32 hours, that is to say, when facilities for the deposition of her eggs are given her soon after emergence. The males live about half as long as the females. No attempts to breed this fly to maturity under artificial conditions were successful.

The egg is elongate in form and cylindrical, tapering towards the end and is about .28 mm long and about .09 mm broad and resembles very nearly the eggs of closely related species. It is laid by the female fly between the glumes of the sorghum spikelet and on or very near the ovary of the plant so that when the young larva develops it may find abundance of food ready at hand without material need of any search. The injury to the ovary of the plant is caused, evidently, by absorption of the juices of the ovary by the larva which appears to carry out the extraction throughout the entire length of its body. The larva when full grown is brick red in general color and the developing pupa possesses the same characteristic shade. When the period for transition from pupa to adult approaches, the pupa works its way upwards and the emergence occurs at the apex of the glumes. After emergence takes place, several seconds are allowed for wing development.

I think I may mention here that there is, at present, in Louisiana an extremely interesting but obnoxious little ant, *Iridomyrmex humilis*, Mahr. This ant is over-running the southern portion of the State and is having considerable attention given to it by reason of its relationship to the agricultural interests of the State. In the sorghum patch in which the experiments with the sorghum midge were carried on this summer, this particular ant abounded. The ants were continually running about the leaves, stems and heads of the sorghum plants attracted evidently by the sweet sap of the plant and the excretions of the aphid which fed upon it. As the adult fly is about to emerge from the pupa, the glumes of the plant are necessarily forced slightly open and the ant, which is omnivorous, is thus allowed to gain access to the helpless pupa. I actually observed an instance where an ant bit off the terminal apex of the glumes and extracted the pupa. Other instances were observed in which the ant was unable to make its way to the enclosed pupa, probably, I suppose, on account of the glumes not being sufficiently open and hence not allowing of a good hold. I have no doubt that in a field in which this ant abounds, the death of many flies may be accounted for.

The total life-history of this species, according to Mr. C. R. Ball, varies from 14 to 20 days. This summer it was estimated that it ran perhaps somewhat longer, between 19 to 25 days. However, this is one of the points that still awaits proof. The entire life-history takes place within the sorghum flower, the egg being deposited there and the adult fly emerging from it when the required developmental period is accomplished. The general habits of this midge, therefore, can be seen to coincide very closely with the habits of already studied and familiar species of the same genus and closely related genera.

In Louisiana this midge is heavily parasitised by *Aprostocetus diplosidus*, Crawford. This parasite is accompanied by a species of Tetrastichus which Professor F. M. Webster considers as probably a secondary parasite.

In reference to the distribution of the midge, I may say that it is more generally to be found over the South than it was first thought. Early in the summer it was known to exist in comparatively few States, but it now appears that it has actually been found in Texas, Louisiana, Alabama, Arkansas, Missouri and South Carolina. For the reason that this midge has not yet attracted the attention of the Experiment Stations, it is altogether probable that it is of more general distribution than these statements show. Its destructiveness, too, is of a varied description. In the alluvial lands of Louisiana, for instance, the main part of the crop is completely spoilt, while in the hill lands of the State, the crop is not so affected and again in Arkansas and Missouri the attacks of the midge are so inconsiderable that its presence would not be suspected.

I will close these remarks by asking an apology for placing before you records of an insect which is probably of only semitropical distribution, but I thought that, as its method of attack closely resembles the attack of nearly related species in the North and as these are practically some of the first remarks on this particular species, this paper might be of interest.

Mr. Treherne then exhibited a Cotton Plant which was grown in the College greenhouse and pointed out the various stages of growth—the bud, the square, the flower and the boll. The only time during the growth of the plant that poison can be satisfactorily applied against the plant's chief enemy, the Cotton Boll Weevil, is between the budding and the squaring stages. Any poison applied after the plant has formed squares is of no use against the weevil for the reason that once the square is formed, the insect feeds within it and hence does not come in contact with the poison.

Experiments have recently been conducted with powdered arsenate of lead as a new poison for the Boll Weevil. Great hopes are entertained by Prof. Wilmon Newell, of the State Crop Pest Commission of Louisiana that this poison will prove to be satisfactory. If these hopes are realized, arsenate of lead may possibly be of use to fruit-growers and gardeners in the North.

He next showed some specimens of the Fire Ant (*Solenopsis geminata*), which is so useful in excavating the larva of the Boll Weevil from the square; the Argentine Ant which is causing much consternation in the households of the South; the Texas Fever Tick and a parasitic fungus on the White Fly (*Aleyrodes*).

HYDROECIA MICACEA, ESP. IN CANADA.

By Arthur Gibson, Central Experimental Farm, Ottawa.

Of recent years much attention has been paid, by several entomologists, to the boring larvæ and the perfect moths of *Gortyna*, *Hydrœcia* and *Papaipema*. In Canada, the best work on these interesting insects has been done by our esteemed member, Mr. Henry H. Lyman, of Montreal. In the United States, our friend, Mr. Henry H. Bird, of Rye, N.Y., has carefully studied the life-histories of many species, probably the most of which have been described as new to science.

The larvæ of some of the moths of this group are, more or less, of economic importance. The Hop Vine Borer, *Gortyna immanis*, Gn., is well known from its ravages in hop yards. In the annual report of the Dominion Experimental Farms for 1892, Dr. Fletcher treats of this insect at considerable length and gives the life-history. The Columbine Borer, *Papaipema purpurifascia*, G. & R.,* is recorded as a destructive enemy of cultivated plants of the genus Aquilegia. The Stalk Borer, *Papaipema nitela*, Gn., is widely known from its attacks on potatoes, tomatoes and corn. The

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*Report, Ent. Soc. Ont., 1904, p. 81.

Burdock Borer, *Papaipema cataphracta*, Grt., is very common in Ontario, and is sometimes very injurious to many kinds of garden plants having thick, succulent stems. It has a wide range of food plants, but in the Ottawa district it has been found boring chiefly in the burdock.

The species, however, which I wish to call special attention to to-day is one which has been reported to the Division of Entomology, on several occasions during the last four years. Attention was first drawn to it in August, 1905, when, early in the month, Mr. George Welch, of Westport, N. S., wrote asking for information as to how to destroy worms which were boring into the pods of his garden peas. He said that the worms were large and quite plentiful. Not recognizing the enemy, Dr. Fletcher wrote asking for specimens. Under date of August 31st, Mr. Welch sent two caterpillars, all he could find at that date, and mentioned that after the end of July they were not so plentiful. One of the larvæ, unfortunately, had died during transportation and the other specimen had changed to the chrysalis state. From this latter a perfect specimen of the moth was reared on Sept. 18th.

On July 13, 1906, Dr. C. A. Hamilton, of Mahone, N.S., forwarded a caterpillar which he had found in a corn stalk. Only one larva was found on that date, but Dr. Hamilton said that other plants had withered away, probably from the same cause. This caterpillar pupated on July 19th and the moth emerged on August 7th.

In 1907, another single larva was received, on July 12th, from Mr. Capel B. St. George, of Tramore, Ont., who stated that he had found it boring in corn in his garden. The moth from this specimen emerged on Sept. 6th.

On June 30th of the present year, Dr. Hamilton forwarded another specimen from Mahone, N.S., which he had found in corn. The moth emerged on August 6th. A larva had also been found a few days previously, but unfortunately had been lost, and a further plant was seen to be injured, but the caterpillar could not be found.

In the collection of insects of the Division of Entomology at the Central Experimental Farm, are two specimens of the moth, which were taken at St. John, N.B., on August 29, and September 12, 1902. These were sent to Dr. Fletcher under the name of *Gortyna medialis*, Sm. In Mr. McIntosh's list of the noctuidæ of New Brunswick,[1] the following note appears:

"*Hydrœcia medialis*, Smith; one taken September 2nd, (1898)." In Dr. Fletcher's Entomological Record for 1903,[2] this moth is recorded as having been "very abundant, August and September, St. John, (McIntosh)." From this statement, and in view of the above occurrences at Westport, N.S., it will be seen that this insect is not uncommon during some seasons in the Maritime Provinces. The record of this insect having been found at Tramore, Ont., is very interesting. While the presence of isolated individual larvæ in corn, or other plants, is of no economic importance, still as shown above, the insect has on occasions been noticeably destructive. The habit of the caterpillars boring into the pods of garden peas, as observed by Mr. Welch, is certainly remarkable and is the only instance known to the writer of a larva belonging to this group boring into anything other than a stem or a root.

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[1] The Noctuidæ of New Brunswick. Reprinted from Bulletin of the Natural History Society of New Brunswick, (St. John) No. XVIII., 1899.

[2] Report of the Entomological Society, 1903.

The following description of the caterpillar was taken from the specimen received from Dr. Hamilton in July, 1906:

Length, 32 mm. Head, rounded, chestnut brown, shining, mouth parts darker. Body: a dirty, creamy colour, with a pinkish tinge on dorsum, except at intersegmental folds. Thoracic shield pale brown, margined anteriorly with dark brown. Tubercles pale brown, each with a single pale hair. Tubercle IV on seventh abdominal segment is almost as large as the upper half of the spiracle, the upper edge being slightly above the upper edge of the spiracle. Spiracles black. Anal shield blackish. Dorsal vessel distinct. No markings whatever on the body. Feet all pale.

A description of the larva from Mr. St. George was also taken, but the only differences which my notes show, are that the thoracic shield was margined in front with black, and the body noted as being greenish-white with a rosy tint above spiracles except at intersegmental folds.

The moth reared from garden peas from Westport, N.S., was submitted to Mr. Henry Bird, who reported upon it as follows: "The Nova Scotian specimen looks like *medialis*. A series might be quite convincing." As this left some doubt about the exact determination of the moth, a specimen was sent to Sir George Hampson, of the British Museum, who determined it as *Hydrœcia micacea*, Esp., with the statement that it was "exactly like European specimens."

In Miss Ormerod's Report for 1898, an account of injury to potatoes by *Hydrœcia micacea* is given, under the popular name of the Potato-stem Borer. This outbreak which occurred at Fyvie, Aberdeen, Scotland, is described as having been destructive to the growing crop of potatoes, especially in gardens. The injury had been noticed every season for some years and a careful examination invariably showed that the damage had been done by the borer. Miss Ormerod quotes from Mr. Richard South: "This species is known to feed in larval stage in Dock and species of Equisetum." In Stainton's "Manual of Butterflies and Moths," vol. 1, p. 198, the larvæ are said to feed "in the roots of various Cyperaceæ." In Kappel and Kirby's "British and European Butterflies and Moths," it is stated that the larva "lives in the roots of *Glyceria spectabilis*, Iris, etc."

The moth which is known as the Rosy Rustic is stated to be "common and widely distributed in Central and Northern Europe in August and September." Miss Ormerod says: "The moth is from an inch and a quarter to a little over an inch and a half in expanse of the forewings, which are variously described as of a pale brown ground color with a rosy tinge, or of a 'rich, reddish brown'; on the wing is a 'broad dark patch', otherwise described as a 'broad median band', the outer portion being 'very rich, dark brown'. Hind wings 'whitish grey with darker central line', or 'dingy grey brown with a darker crescentic discoidal spot and transverse median bar'; the antennæ nearly white."

The above occurrences of *Hydrœcia micacea* in Canada are, as far as we know, the only American records of this insect.

FURTHER NOTES ON THE COCCIDAE OF ONTARIO.

BY TENNYSON D. JARVIS, O.A. COLLEGE, GUELPH.

In last year's Annual Report, I gave an account of forty-eight species of Coccids for Ontario. Further collections and investigations have enabled me to add the following to the list.

Kermes galliformis (Riley), Red Oak, Toronto.

Saissetia hemisphaericum (Targ), Cotton, etc., Conservatories in most parts of Ontario.

Aspidiotus abietis (Schr.), Hemlock, Guelph.

Chrysomphalus aonidum (Linn.), Ficus elastica, Conservatory, Guelph.

Ischinaspis longirostris (Signoret), Palm, Conservatory, Toronto.

Undetermined Species of Pseudococcus.

On bark of Apple—*Pyrus malus*, Guelph.
" " Hawthorn—*Crataegus sp.*, Guelph.
" " Horsechestnut—*Aesculus hippocastanum*, Guelph.
" " Beech—*Fagus ferruginea*, Guelph.
" " Willow—*Salix sp.*, Guelph.
" " Lombardy Poplar—*Populus italica*, Guelph.
On leaves of Soft Maple—*Acer saccharinum*, Guelph.
" " Willow—*Salix sp.*, Guelph.
On roots of Raspberries—*Rubus strigosus*, Muskoka.
" " Blueberries—*Vaccinium Pennsylvanicum*, Muskoka.
" " Goldenrod—*Solidago canadensis*, Guelph.
" " Yellow Avens—*Geum strictum*, Guelph.
" " Yarrow—*Achillea millefolium*, Guelph.
" " Wormwood—*Artemisia sp.*, Guelph.
" " Ox-eye Daisy—*Chrysanthemum leucanthemum*, Guelph.
" " Daisy Fleabane—*Erigeron philadelphicum*, Guelph.

Kermes galliformis (Riley).

These scales occur either singly or in clusters on the twigs and branches of Red Oak (*Quercus rubra*). The form of the adult female puparium is globular with a slight incision for insertion on the stem of the food plant.

It is nearly smooth and somewhat shining. The colour is white and beautifully variegated with yellowish, gray and black. Mr. A. Cosens found this fairly common on Red Oak at Toronto.

Saissetia hemisphaericum (Targ.)

The adult female varies from light to dark brown, frequently shaded with darker brown to black.

It is more or less hemispherical or slightly elongate and convex. The surface is smooth and shining to the naked eye but with higher magnification is seen to be thickly studded with little dots. The immature female is usually of a pale yellow with a well defined central and two lateral carinae. It is a very common scale in conservatories throughout Ontario.

Aspidiotus abietis (Schr.).

Puparium of the female oval or elongate oval and the side next the midrib compressed and straight. About 1.5—2 mm. long and 1—1.2 mm. wide. Colour dark brown; back convex. Exuviae central, dull yellow. Common at Guelph on Hemlock (*Tsuga occidentalis*).

Chrysomphalus aonidum (Linn.).

Adult female puparium circular and somewhat convex. Colour reddish brown, turning paler towards the margin. Exuviae central, dark orange and nipple-like. It has been found in the conservatory at Guelph on *Ficus elastica*.

Ischnaspis longirostris (Signoret).

The puparium of the adult female is very long and narrow. Back shining black; exuviae orange coloured. A few specimens were found in a Toronto conservatory.

DISTRIBUTION OF SAN JOSE SCALE (*Aspidiotus perniciosus*) IN ONTARIO.

The San Jose Scale is slowly gaining ground in Ontario. The most northern point of infection is at Lorne Park, County of Peel on the northern shore of Lake Ontario.

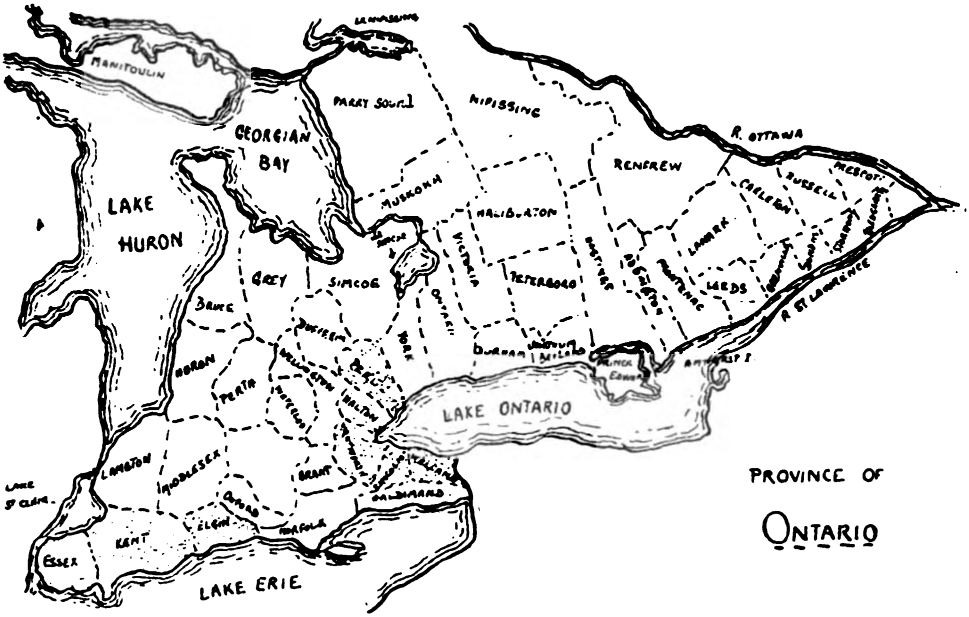


Fig. 6. The shaded portions of the map shew the counties of Ontario in which the San Jose scale is now established.

THREE NEW HOST PLANTS FOR EULECANIUM CARYAE IN ONTARIO.

Rock Elm (*Ulmus racemosa*), Hornbeam (*Ostrya virginica*), Blue or Water Beech (*Carpinus caroliniana*). We have now five host plants for this scale in Ontario.

A NEW HOST PLANT FOR E. FLETCHERI IN ONTARIO.

This year *E. Fletcheri* was found at Guelph on Red Cedar (*Juniperus virginiana*).

ONE BROOD FOR THE PINE SCALE (*Chionaspis pinifoliae*) IN ONTARIO.

This scale passes the winter in the egg stage. The eggs hatch in the early part of June and the female reaches maturity about the middle of August when she lays her eggs which do not hatch until the following year.

SOME ENEMIES OF ONTARIO COCCIDAE.

BY J. W. EASTHAM, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Leaving out our wild birds, upon which I have nothing to say, the enemies of Scale insects or Coccidae may be divided into three classes, namely:—

1. Predaceous insects;
2. Hymenopterous parasites;
3. Fungus Diseases.

Amongst predaceous insects the members of the family Coccinellidae or Ladybird beetles are by far the most numerous and most important. Of these insects one of the most beneficial is *Hyperaspis signatus*—a small black beetle with a small red spot on each elytron. The larvae of the species of Hyperaspis do an immense amount of good by destroying large numbers of the egg sacs of the Cottony Maple-scale (*Pulvinaria innumerabilis*). The larvae are large, white and mealy, and much resemble certain species of Dactylopus, for which they might easily be mistaken by a casual observer. The larvae pass from one ovi-sac to another, devouring the eggs as they pass along, but leaving the ovi-sac apparently little the worse externally. During the summer fully 80 per cent. of the ovi-sacs of Pulvinaria in the vicinity of Guelph were destroyed by the Hyperaspis larvae.

Another very common and important species is the Twice-stabbed Lady-bird (*Chilocorus bivulnerus*), Fig. 7, the adults and larvae of which are to be found feeding on no fewer than seven species of scales in this neighbourhood. Its special favourites, however, are the Oyster-shell Bark-louse and Curtis Scales, on both of which it is usually quite common. It is interesting to note that the larvae of this insect are preyed upon to a considerable extent by Lace-wing fly larvae (*Chrysopa*). Figs. 8 and 9. Another species which preys more especially upon *Eulecanium cerasifex* is the 13-spotted Lady-bird (*Hippodamia 13-punctata*), Fig. 10. These larvae are very thorough in their work as they devour everything but the body walls of the scale.

Another common predaceous insect is a small mite *Moniezziella, sp.* which is generally found feeding on the Oyster-shell Bark-louse and Curtis scale, especially the former; it is also found feeding on the eggs of *E. cerasifex* but not to any great extent.

Another predaceous insect occasionally to be found is a Lepidopterous larva which eats its way through the cottony masses of *Pulvinaria innumerabilis*, and in this way one caterpillar can destroy many scales. Although several attempts were made I was unable to rear the adult; but in all probability it is the larva of *Laetilia coccidivora*, Comst., an insect whose larvae prey on Pulvinaris to a considerable extent in some parts of the United States.

Turning next to the Hymenopterous parasites, we find that in this district they belong entirely to two sub-families of the Chalcididae or Chalcis Flies—the Aphelininae and Encyrtinae. These two families are readily distinguished from each other by the fact that members of the Aphelininae have 8-jointed antennae, a divided meso-pleura, and the middle tibiae are not specially adapted for saltatory purposes. The Encyrtinae, on the other hand, are characterized by the large saltatory spine of the middle tibiae, which is generally long and stout, though less frequently it is found dilated at the base, and armed with a double-row of black teeth or spines. This last feature readily marks off Encyrtinae, as no other family, as far as I am aware, possesses this large saltatory spine.

The Aphelininae are generally parasitic upon the Aleyrodidae or, amongst Coccidae, upon members of the sub-family Diaspinae. The commonest member of this family is *Aphelinus mytilaspidis*, a small yellow parasite which attacks several species of scales but principally the Oyster-shell Bark-louse. The larva feeds on either the scale body or eggs according to the time of the year; but like most Aphelinids there is not usually more than one larva to a single scale. The larvae, when full grown, are about 1 mm. long and very stout, being almost as broad as long; the pupae, stout, dark and contracted.

It appears to be double brooded as the adults were reared at the beginning of June and end of August; the adults may be usually observed ovipositing on the young scales during June. Another closely related species is *Aphelinus fuscipennis* which attacks both San Jose and Curtis Scales. This parasite is widely distributed, one being common on San Jose Scales in some parts of the United States. It differs from the preceding species in having slightly clouded wings.

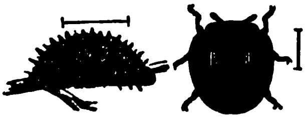


Fig. 7. Twice-stabbed Lady-bird, larva and beetle.

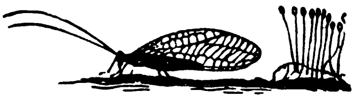


Fig. 8. Lace-wing fly and eggs.

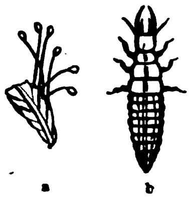


Fig. 9. Lace-wing fly eggs and larva.

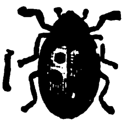


Fig. 10. Thirteen-spotted ladybird.

Another very important member of this family is *Coccophagus lecanii*—a small Chalcid with yellow markings upon the meso-scutum and scutellum. It is this parasite, acting in conjunction with *Hyperaspis signatus* mentioned previously, which so effectively controls the outbreak of Cottony Maple Scale (*Pulvinaria innumerabilis*). It is amongst the Encyrtinae, however, that we find the most important Hymenopterous parasites of the Coccidae. During the last summer some twenty species of parasites belonging to this family were reared by me from various scales—but principally from the various species of Lecanium. No fewer than ten of these species, or 50 per cent. were reared from one species of scale, namely *Eulecanium Fletcheri*.

The most common of the Guelph representatives of this family belong to the genus Comys, of which three species are found in this neighborhood.

Comys scutellata is a large, handsome species which parasitizes *Eulecanium caryae* to such an extent that few scales escape. It is probably a European species, accidently introduced and now widely distributed in North America. *Comys fusca*, a closely allied form, is very common around

Guelph parasitizing the New York Plum Scale (*E. cerasifex*). It is this parasite which is so effective against the Brown Scale in parts of California.

Other common genera belonging to this family are Blastothrix, Chiloneourus and Encyrtus—all of which are found on the Lecaniums of the district. No fewer than 41 specimens of an Encyrtid were reared from a single scale of *Kermes pubescens*, an occurrence which seems to indicate that polyembryony exists, at least among some of the Scale parasites: as it seems incredible that 41 eggs would be deposited in a single scale.

Coming to the fungus enemies we find on record several species from various parts of Ontario, only two of which I have found in the vicinity of Guelph. Of these two *Cordyceps clavulata* is by far the more abundant. It is, however, of not much economic value as it does not appear till late in the season—this year it was nearly the end of July. It attacks chiefly *E. cerasifex* but also *Fletcheri* and occasionally *E. caryae*.

The other fungus is known as *Microcera coccophila* and attacks the Curtis Scale—the attacked scales being entirely destroyed. The small red fruiting bodies of this fungus only appear after rain, disappearing again within the space of a few hours after the rain ceases, and consequently, since the spread of this fungus appears to be dependent upon rain, it is not of any great economic importance, at least in this part of Ontario.

"SOME BEETLE HAUNTS," BY AN AMATEUR BOTANIST.

By F. J. A. Morris, Trinity College School, Port Hope.

In my four seasons of collecting, as a coleopterist, there have been three collecting grounds that have most attracted me: (a) Stumps and tree trunks; (b) Blossoms; (c) Foliage. In all three I have found a considerable range of beetle-guests and am able to record rare or interesting finds. It is probable in the second of these three haunts that I have had most success, but it is with the first that I intend chiefly to deal in this paper.

There are two conditions under which stumps make a good collecting-ground; one is when they are dead and dry, but have the bark still covering them; it was this condition that first drew my attention and held it through my first season as a collector. The other condition is when there is yet some life in the wood so that the top of the stump bleeds. I have found that stumps ooze sap in this way for several seasons after the tree has been cut down. A good way to catch beetle-visitors is to scatter some good sized chips or lay a slat or two of wood or bark on the top. Most beetles are active at night, and when there is a shelter of this sort, they take cover there instead of flying away when the sun rises. Easily the best tree for its range of beetle visitors, as well as for total quantity, I have found the basswood; next to that the white pine; then the maple, the birch and the elm. Often when a stump is dry and apparently not in a condition to attract guests it may be made inviting if the bark is still partly green. I have often pried up the bark with a chisel and laid the strips thus removed on the top of the stump; the smell of the sap or juice fermenting has generally lured some prizes to this bait and trap combined.

The season for collecting in this way may be said roughly to extend from the beginning of May to the middle of July. I began collecting in the spring of 1905, but as I went to England at the end of June I did not make much headway that season. In 1906, however, I did a great deal of collecting and gained quite a lot of experience. One of my first finds was at the beginning of June while prying the bark from a basswood stump. I discovered something like a dozen specimens of *Saperda vestita*, newly hatched and buried in the inner bark of the tree. I had my killing bottle with me, but as the insects were still soft I put them into a small tin box. Here they crawled about excitedly, squeaking (or rather, stridulating) when handled. On examining them after my return home, I found they had fought in the box, two of them had had their antennae nipped off and several had been deprived of their full complement of legs. I had not yet learned the advantage of laying the detached bits of bark on the stumps as shel

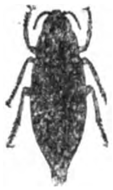


Fig. 11. Dicerca divaricata.

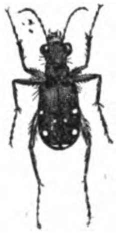


Fig. 12. Cicindela sex-guttata.

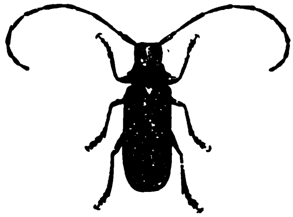


Fig. 13. Monohammus scutellatus.

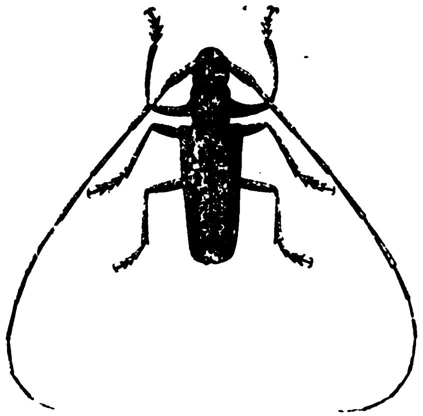


Fig. 14. Monohammus confusor.

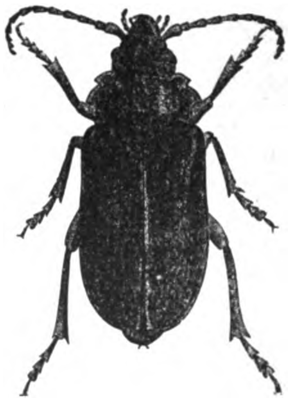


Fig. 16. Prionus laticollis.

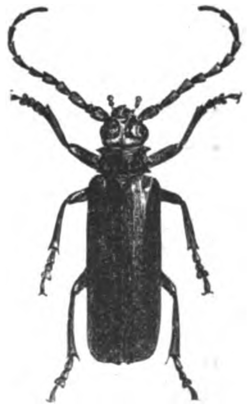


Fig. 15. Orthosoma brunneum.

for nocturnal visitors and so missed a golden opportunity. However, there were a number of basswood stumps in the clearing where I made my first capture and from these I got several more specimens.

About the last day of June in the same season while struggling from a tamarack swamp in which I had found a rare fern (*Botrychium simplex*), I noticed a falling and decaying trunk of elm and on removing some bark I found it infested with a larva closely resembling that of *Saperda vestita;* I took one that appeared nearly full grown, with some of the rotten inner bark, and succeeded in rearing it; some three weeks later it emerged from the pupa as the elm-borer (*Saperda tridentata*). I have taken only one other specimen of this beetle; it settled one fine Sunday night in June on a supper table at which I sat, a guest; the entomologist, however, would not be denied, and in spite of looks of outraged propriety on the part of my fellow guests, and some embarrassment (not mine, but my hostess'), I produced a cyanide bottle and captured the insect.

Early in July I went to Oliver's Ferry, on the Rideau, and in a day or two chanced upon a spot that proved a regular treasure house to the young collector; it was at the side of a path through a wood of young growth, mostly basswood and maple. Here lay a log of basswood with the bark still on it, close by the stump from which it had been cut, and a pile of basswood split and stacked. In the bark of the stump and the log I found larva and pupæ of the *Saperda vestita;* some pupæ that I took home lived and from two or three I secured specimens of the imago. In the hot sunshine beetles lit on the log and on the wood pile, and I tried the experiment of laying detached pieces of bark on the stump, the log, and the split wood; sometimes sandwiching bits of bark between sticks of the wood pile. This simple contrivance of bait and trap yielded splendid results for over a week, at the end of which time the bait was filched by the sun drying all the moisture out. My captures comprised an Elater as large as *Alaus oculatus* and dark pitchy brown in colour; two specimens of a *Chalcophora*, 3 or 4 of *Dicerca divaricata* (Fig. 11), and 15 of a *Chrysobothris* about the size of the apple borer (*Ch. femorata*); a dozen or more of a blackish weevil akin to the strawberry weevil, some two dozen specimens of *Eupsalis minuta*, sexes evenly divided 25 specimens, of *Parandra brunnea*, one specimen of *Tragosoma Harrisii*, and a beautiful specimen of the little *Amphionycha flammata;* this last Dr. Bethune tells me, has seldom, if ever, been reported from Ontario, and it may therefore be interesting to some of you to know that I captured a second specimen of the same beetle about three days later, sunning itself on a leaf of basswood, within 50 yards of the first capture. It was a bright, calm day in July when I captured the first, and very hot with the sun almost at its zenith, and the log on which the insect lit was bathed in sunshine; small as the creature is, the sharp click with which it settled was distinctly audible. As the basswood pile was beginning to fail me, I happened on a clearing where some small maples had been felled. Finding the stumps still moist, I laid chips and bark about their tops. This yielded me several new species—a beetle marked like the *Megalodachne*, but smaller and with the ground-colour light brown instead of dark chestnut; 3 or 4 specimens of a beetle allied to the weevils, I think one of the *Anthribidae;* and, settling on a stump in the sunshine, a magnificent specimen of *Purpuricenus humeralis*, a longicorn of great beauty.

At the end of August I was out fern-hunting at Lake Dalhousie, about 20 miles north of Perth. From a stump of white pine I took the pupæ of a longicorn which later emerged as *Rhagium lineatum*, and while raising some chips from the top of a fresh and resiny stump of white pine I drove from cover a Clerid that was then new to me; the head and thorax were dull orange, the base of the elytra the same, the rest of the elytra was alternate grey-white and black. Up to that time I had only found two species—a small scarlet one, fairly common, under bark, and one banded with orange and dark blue, which is frequent on certain blossoms. Early next spring, about April the 28th, I found some white pine had been felled in the winter, not many miles from the school in Port Hope. Recollecting my find of the previous autumn, and thinking the fresh resin might be the attraction, I laid some bits of bark and chips on the surface of the stumps. On visiting my traps a day or two later I was agreeably surprised to find 3 specimens of the resin-loving Clerid. About the same time I got 5 more specimens from newly-felled pine, under the chips that had been left on the stump by the axe. Some of these stumps I baited with chips and in all captured about a dozen. I have never found them on dry stumps, but only under fresh chips and associated with new resin. The creature closely resembles a beetle, figured by Curtis in his British Entomology as *Thanasimus formicarius*. It is there said to frequent the Scotch fir, which, of course, is also a pine.

About the middle of May in the same season (1907), I visited the basswood stumps from which the year before I had got the *Saperda vestita*. Some of the bark that I pried up was infested with *Leptura ruficollis*, and I took also from under the bark two pupae of a longicorn closely allied to *Urographis*. Ripping some bark from the sides of several stumps I laid it on the tops. This proved an admirable bait, and among my captures were 3 or 4 specimens of a tiger-beetle (*Cicindela sexguttata*), Fig. 12, 7 specimens of a rove-beetle (*Staphylinus violaceus*), 12 or 14 of the northern Brenthid (*Eupsalis minuta*), a single specimen of a locally rare darkling beetle *Phellopsis obcordata*), 5 Penthes and 6 or 8 *Alaus oculatus*. I may say that I have found the species *oculatus* very common on the basswood, and in one or two cases the beetle, under concealment of the strips of bark, had during part of the night half buried itself in the wood of the stump. The beetle can eat very fast. A friend of mine took 9 or 10 from a rotten basswood log and sent them to me in a stout cardboard box. When I got the parcel, one of the largest specimens had eaten a hole through the corner of the box and was through two folds of the brown paper wrapper. I have never found the allied species of *myops* on basswood but always in white pine, usually under the bark of dead, dry stumps where it is fairly abundant.

Later on in the same season, while wandering about the upper reaches of Gage's Creek, about 6 miles from the school, I passed through a clearing in which hemlock had been felled. Among several other Buprestids settling on the bark of prostrate logs as well as standing trees, were two that were new to me, both very active and only to be caught (unless you had a net) by careful stalking—one a small *Chrysobothris* and the other *Melanophila Drummondi*. This last I had never seen before and have never seen since, but on this newly-felled hemlock, as well as on living trees, it was abundant, and I captured about a dozen specimens. A few days later, at the end of June, I took to the clearing a brother-collector anxious to see *Melanophila Drummondi* in its native haunt, and there I turned him loose. While I was looking about with my eyes focussed for beetles, I distinctly saw a pair of longicorns running on the trunk of a tall elm growing at the foot of the clearing near the stream. From their movements and appearance both I felt sure they were longicorns and at first took them for a pair of *Cyrtophorus verrucosus*, a beetle I am well acquainted with. An instant's reflection told me that at ten yards' distance a beetle the size of *Cyrtophorus* would hardly be visible, and I rushed towards what I was certain must be a prize. Unfortunately the beetles were running in an upward spiral and when I stumbled to the tree over a rotten log they were almost out of reach. I jumped and managed to brush one to the ground, but could not see it by the most careful search. However, I waited patiently for a minute or so, and then to my great delight saw the creature emerge from the ground and re-ascend the trunk. As I captured it I recognized in it the *Physocnemum brevilineum*, a long-coveted species. Scanning the tree carefully I presently descried 2 more of the beetles running about on the bark, some 20 feet up. I stayed for nearly an hour at the foot of the tree, with hope in my heart and a crick in the neck, as intent as a dog listening to the clatter of a squirrel,—and my reward was three or four specimens of the beetle. As a rule, they appeared at a height beyond range, on the trunk of the tree, walking rapidly downwards, following the corrugations and grooves of the bark. Occasionally, however, they lit on the tree after flight through the air, but they rarely, when disturbed, took to the wing for escape, preferring to run or to release their hold and drop. A six mile walk is nothing when a new longicorn is waiting just around the last corner and I made the tree the turning post of my daily course for nearly a week, by which time I had taken 15 or 16 specimens. The tree was apparently sound, with a magnificent crown of foliage surmounting the massive pillar of its trunk, but the beetle was breeding there. I am pretty sure, and in July of this year, while I was in England, my fellow-collector got several more specimens on the same tree.

Early in July I made an expedition to Garden Hill, some ten miles north of Port Hope. Here they were cutting out the pine from a 20-acre lot and a saw mill was at work. I went out in hopes of getting some specimens of *Monohammus*, a beetle that with a single exception I knew only from cabinet collections. The lumbermen said they had seen numbers of these insects on the logs and in the brushwood, but from inexperience, or ill-luck, I failed to secure many; my bag included one pair of the large grey *Monohammus*, 3 isolated specimens of *Monohammus scutellatus* (Fig. 13), and one specimen of a third species of *Monohammus*, the elytra being in colour a mottle of three or four shades of rust yellow, and the insects in size almost identical with *scutellatus*. By preparing several stumps and logs with chips and stripping the bark from dead trees I got several other longicorn beetles, such as *Criocephalus agrestis*, *Orthosoma brunneum* (Fig. 15), *Tragosoma Harrisii*, and a carcase of *Prionus laticollis* (Fig. 16). Had this been all I would have felt some disappointment, but it wasn't. The place was a veritable paradise of Buprestids, and not only did I get 12 or 14 species in all, but among them several quite new to me, beginner as I was. There were at least two (probably three) species of *Chrysobothris*, two of *Chalcophora*, three or four of *Dicerca*, two or three of *Buprestis*, and a black *Melanophila* with a nasty bad habit of settling on the back of one's neck and giving it a sharp nip.

There could be nothing more enjoyable than roaming about in that clearing, and though it is nearly a year and a half ago, it seems like yesterday. It was glorious July weather. In the distance you could hear the Mourning Dove, and round about in the brushwood and trees were several pairs of Towhees and not a few slate-coloured Juncoes. While ranging up and down, I noticed on a bare, dead trunk of pine a bright looking beetle with apparently a damaged wing, for it stood out from the creature's body at an angle. At nearer view this resolved itself into a brand new Clerid, the largest I had ever seen, and in its jaws was the elytron of an *Elater* off which the monster had just been dining; no midnight assassin, but a cannibal in broad daylight, and the rascal was flaunting his trade in one of the gayest liveries you ever saw; the head and thorax were orange, the shoulders (or base of elytra) black, round the waist a broad sash of brilliant scarlet, below that another band of black, then a band of grey-white, and the tips of the elytra black. In two all-day visits to this place I caught five of these beetles, three of them red-handed—one on a stump with an ant in its jaws, a third on a fence-post dissecting a grub of some kind, the other two belonged to the blameless order of those who have not yet been found out. One was resting on a rail along which a stream of ants happened to be crawling, and the fifth was just issuing from an ant bore in a dead pine, down which motives of curiosity, doubtless as innocent as idle, had prompted it. The same impulse, I think, rather than any misgivings about my intentions, caused it to disappear down an adjoining tunnel, whence my forceps finally extracted it.

In the season just over (1908) I noticed some felled maple and birch on a hillside 7 miles from Port Hope. At the beginning of June I laid chips about two or three of the stump heads; on the fallen trunks I found an immense number of *Chrysobothris breeding*, while under two of my chips on the maple I took two pairs of *Urographis fasciata*, and resting on a stump near by I captured a *Leptura biforis*.

About the middle of June my attention was drawn to some white pine felled in the winter among some woodlands, known locally as Pine Grove. There were about eight trees in all, lying on the ground within a space of about a mile. On the trunks and branches were crawling a number of small dark Clerids with a mark of crimson and two marks of white on each elytron; there was also two sorts of weevil abundant under chips of wood on the ground, and many Buprestids visiting the logs; but in especial, on the trunks, limbs and larger branches there were *Monohammi* breeding. In about six visits I took well over 100 specimens, and my fellow-collector continued to find longicorns up to the 20th of July or later. Our combined captures would amount to 250 beetles. The great majority of these were *Monohammus scutellatus*, of which I took 100, mostly in pairs. I took besides 8 or 10 specimens of the large grey *Monohammus* (whether *titillator* or *confusor*, Fig 14, I am not sure), and four of both sexes of the rust-yellow species. We also got several specimens of a stout grey beetle resembling *Urographis*, but without the extended ovipositor, and a few of a grey species of delicate structure and extremely fine antennae (perhaps *Liopus*). About the middle of July my friend took some 12 specimens of *Leptostylus parvus*. All this on some ten trunks of newly-felled pine.

Our experience raises a question as to the length of time required by the larvæ to mature. There was a tree among these others that had been blown down early in 1907, and was thus in its second season. It was full of holes, most of them quite fresh, from which mature insects had escaped. We could hear larvæ at work during June inside the log, but we did not see any beetles breeding or laying eggs on the bark, as they were doing on all the fresh-fallen trees. Unfortunately, most of these trees have since been removed. I am inclined to think that the dryer the wood is, the longer the larva takes to reach its full growth, and that if the larva hatches in fresh wood it can mature in a single season. I should think this was true of the *scutellatus*, anyway, even if *confusor* and *titillator* require longer. The well-known stories, most of them authentic, about the mature insect escaping from tables and chair legs several years after the manufacture of these articles, would thus illustrate an exceptional state of things in which the larva was confronted prematurely with dry wood to feed on.

Besides these captures on stumps and logs, I have made several by using a similar trap with fungus substituted for bark. But at present I shall content myself in my closing paragraphs with a few general remarks on the subject of blossoms, as a collecting ground for beetles.

If you refer to any handbook of North American flora, you will find about 130 natural orders of flowering plants. The vast majority of these, however, do not offer their sweets (or pollen, rather) to those browsing cattle among insects, the beetles, whose short jaws and general habit incline them to visit only small shallow blossoms growing in close clusters (racemes) or in flat bunches or heads. Nearly all the blossoms that form a favourite haunt for beetles are included in the series between order 25 and order 50, beginning with the sumach and the vine and ending with the composites. The only important beetle-food outside that series in my experience, is the milkweed and its ally, the dogbane, which come about No. 70 in the natural orders.

If you look a little more closely at the series from 25 to 50, you will find these fall into two distinct groups of eight, separated from each other by a wall of 10 consecutive orders unattractive to beetles.

The first group extends from the poison ivy and the grape vine, through the New Jersey tea and the spiked maple to the great rose family. Of these, the milkwort and the vetch, from the form of their blossoms, are valueless; the poison ivy and the grape vine are fairly good, but the range of their guests is limited. The New Jersey tea is a plant with hardly a rival, both for range of species and for total number of insects. The spiked maple is also a rich storehouse of beetles. In the rose family I have found the hawthorn best, next to it the rose and the bramble, and then the spiræa and the choke cherry.

The second group of eight begins with the umbellifers, and passing through the dogwood and the elder, closes with the great composite family. Of these the bed straw, valerian and teasel, are comparatively worthless; but the dogwood is an excellent host and so are the two species of elder, while several of the composites are worth careful scrutiny.

I shall carry this principle of selection a little farther, by giving a rough outline of a season's beetle collecting from blossoms. The first blossom to open is the early or red-berried elder (*Sambucus pubens*). It varies considerably from season to season, as well as in any one season, owing to differences of location; but about the 10th of May it will be found flowering and its season may last for ten days. It is immediately followed by the hawthorn, which lasts till, perhaps, the 10th of June. By this time the spiked maple and the dogwoods are in flower, and before this last is over comes a riot of blossom, for the late elder and the New Jersey tea both open in the last days of June.

These blossom haunts, then, extend from early in May till the middle of July. The only other conditions of time that need be mentioned are that the pollen on a given blossom must be in a certain state of ripeness or it does not appear to attract beetles at all, and, as a rule, the sun must be shining on the blossoms. If it is hot and calm besides, then you have ideal conditions.

There is, however, an important condition of space to add to these of time. I have, as a beginner, spent hours in fruitless search over whole hedges and thickets of elder and bushes of hawthorn, when ten minutes at a single shrub with only a few meagre blossoms on it would yield a rich harvest. Why? Because the flowers must be growing near a thicket or a wood. If they are in the open, even a hundred yards or so from timber lands, they are almost useless. This is particularly the case when it is longicorns you are on the look-out for. It is, of course, well-known to coleopterists of experience that a clearing or the border of a wood is the best locality. It is remarked again and again by Bates in his travels on the Amazon, and it is pointed out by Rye and Fowler in their hints to collectors in Great Britain.

In closing I should like to say that by no means the least pleasure to a lover of nature is to observe the marvellous constancy with which season after season these tiny creatures, the offspring of a last year's brood, return to their ancestral haunt, be it blossom or leaf, true to the clock of the year, almost to a day; in obedience to a law there is no gainsaying, and which yet in the creature's serene unconsciousness seems robbed of any touch of harsh compulsion.

TWO ADDITIONS TO THE LIST OF BUTTERFLIES OF THE ISLAND OF MONTREAL.

By Albert F. Winn, Westmount, P. Q.

One of the great attractions of collecting Butterflies and Moths lies in the probability of coming across, at any moment, something new to the locality in which one is working, even though common elsewhere.

Although the district about Montreal has been fairly well worked ever since the formation of the Montreal Branch of the Entomological Society of Ontario, 35 years ago, not a season passes in which we do not find some moths large or small not previously observed and recorded. But finding a new butterfly is a different matter and it was indeed a pleasant surprise when I came across a specimen of the little pepper-and-salt Skipper, *Amblyscirtes samoset*, Scudder, flying over a very muddy field at Pt. aux Trembles, near the rifle ranges on June 7th, and a few minutes later I took another. My companions also wanted some and a thorough search was made, resulting in Mr. Chagnon also capturing one in an adjoining field. The species is apparently commoner to the north among the Laurentian Mountains, where I have taken it at Montfort and St. Faustin, and also at Calumet on the Ottawa River—always in early June.

A month later—July 12th—while walking across the Westmount Golf Links, with Mr. A. R. M. Boulton, of the Quebec Branch, a small yellow butterfly passed us, which looked like a very much undersized *Colias philodice.* My net was not ready, so my companion offered to catch it for me if I wanted it, but as the day was very warm I said not to chase it as it would probably come back, but it kept straight on. We went the opposite way, to the Nun's Woods at Cote St. Luc, to look for *Haploa confusa*, Lyman, and were busy catching a series of these moths, when another of the little yellow butterflies came along. I was ready this time and in a moment secured the first specimen of *Terias lisa*, Bd. and Lec. (the little Sulphur, Holland aptly calls it) that I had seen alive. Another soon appeared in the same place and Mr. Boulton captured it. As we were close to a fine field of clover we thought the butterflies were probably coming from it and therefore turned our attention to it, but without seeing any more. We resumed our raid on the Haploas, going further into the woods where *H. confusa* was scarcer and *H. Lecontei* more likely to be found. We were again lucky, for on coming out of the woods on the west side into a small cedar swamp another *Terias lisa* was flitting about, which I easily caught. As no more were visible we adjourned to Cartierville for lunch.

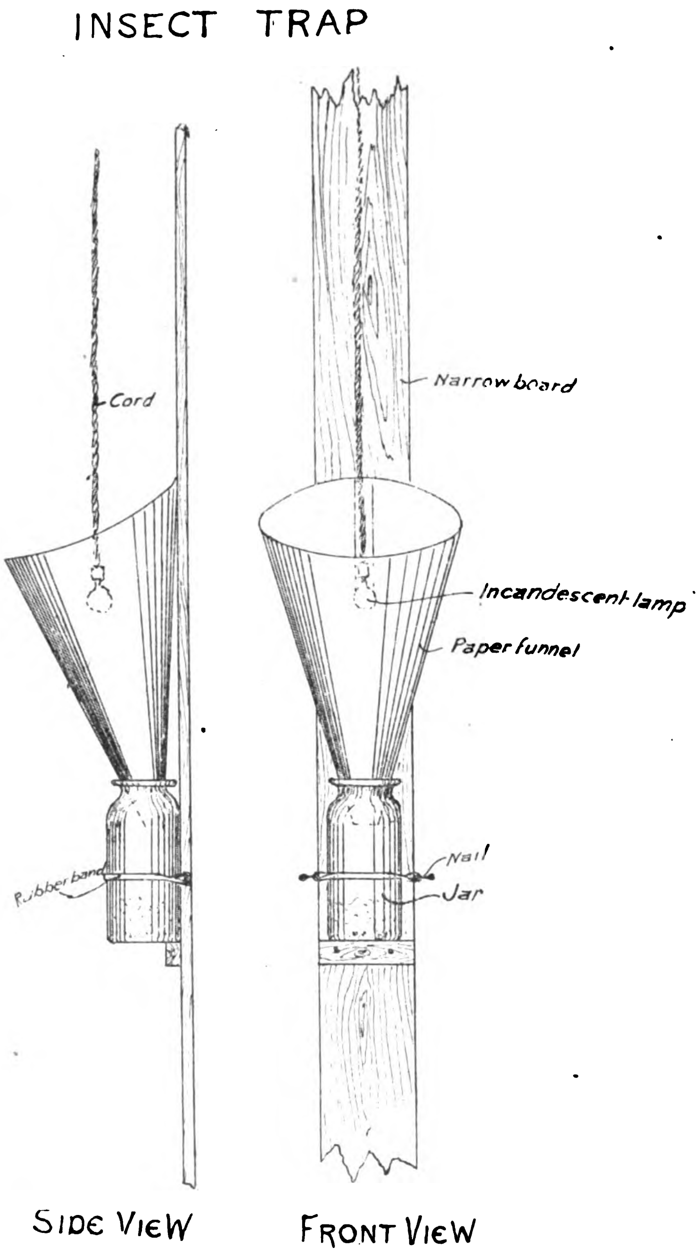

INSECT TRAP
Cord
Narrow board
Incandescent lamp
Paper funnel
Rubber band
Nail
Jar
SIDE VIEW
FRONT VIEW

Fig. 17.

COLLECTING WITH A LANTERN TRAP DURING THE SEASON OF 1908.

By J. D. Evans, Trenton.

The apparatus used during this season consisted of a quart gem jar charged with cyanide of potassium. The jar was prepared in the following manner, lumps of the cyanide of potassium were distributed over the bottom of the jar upon which were placed cork crumbs to the depth of about 1¼ inches—then plaster of Paris formed with water to the consistency of cream poured in to the depth of about 1¼ inches, (although a ½ inch or ¾ inch would have been sufficient.) In all other respects the trap was prepared and set up as described in the Canadian Entomologist for May, 1907. The plaster of Paris gives a better bottom and remains in better condition than the cotton batting filling as there described. This jar remained in good condition for at least three months' service, then getting weak a ⅜ inch hole was bored in the plaster of Paris and lightly stopped with a loose plug of cotton batting and a small quantity of chloroform poured into the hole by the aid of a glass funnel, a charge thus made would last for several nights.

Collecting with the trap was commenced in the first week of June and continued daily uninterruptedly until the end of September, except for a night very occasionally when it was raining—there is no record of these nights during June and July, but perhaps one night in each month would be the limit, but in August the 12th was the only exception and the 28th in September. The 4th September was a very cold night and the trap was not put out.

A daily record of the number of moths taken was not kept during June and July, but frequently the number exceeded 200 and upon one night the number was 434. During August the total number of moths taken was 2,724, the greatest number in any one night being on the 31st, when 220 were taken; the smallest number on the 24th, when 21 were taken. In September the total was 893. The largest catch being on the 5th, 160 moths and the smallest on the 15th and 19th, which were each only 2. These nights being very cool, the 29th and 30th being very cold nights nothing was taken.

Besides the moths, insects of several other orders were taken. Beetles of a considerable number of species, Hymenoptera, Diptera, Hemiptera (principally leaf hoppers of many species), Trichoptera, and Neuroptera. Upon some nights the jar would be almost full of myriads of Phrygania flies, midges, and other insects, and upon one occasion the jar was not only full but the mass extended up some distance into the paper funnel.

One might imagine that the moths would become spoiled with the multitude of occupants, but such is not the case, for many a moth was taken with its scales and fringes in perfect condition, even if in company with large beetles, such as the Lachnosternas.

With the exception of the moths, the captures in the other orders have not yet been named and listed for want of time, but with the moths there have been 281 species listed and a large number yet unnamed more particularly among the Micros.

NOTES ON THE QCCURRENCE OF LACHNOSTERNAS IN 1908.

By J. D. Evans, Trenton.

During the past nearly forty years the writer has collected Coleoptera and paid particular attention to the Lachnosternas, (commonly known as May Beetles or June Bugs), but a dozen or so specimens would be the maximum number taken in any one season and more often the number could readily be counted on the fingers of one hand. *Fusca* was considered the common species, but Dr. J. B. Smith separated and named others in the family or group *fusca* viz. *arcuata*, *insperata* and *dubia*. Since then it has been found that *fusca* is quite uncommon, the common species being *insperata* and *dubia* and the manner of separating these two species as given by the late Dr. Jno. Hamilton is the presence or absence of a tuft of hair on the head next to and between the eyes, in some specimens this tuft of hair may be much abraded.

The Lachnosternas were very numerous, this season the writer took 168 specimens either at lighted windows or in the trap, of which 91, or more than one-half of the number were *fusca*. The females of *insperata* and *dubia* are quite common, being usually about one-third of the number of the males, but with *fusca* it is very different, for the writer has never seen a female *fusca* among a large series taken at Trenton, Belleville, Sudbury and Ottawa and not until this season when one female only was taken as against 90 males. *Ciliata* is another species a few specimens of which are taken almost yearly, but yet the female has never been seen by the writer.

The number of specimens taken of each of the species throughout the season, being from 17th May to 6th July. is as follows: *Insperata*, 44 males, 10 females; *dubia*, 5 males, 14 females; *fusca*, 90 males, 1 female; *ciliata*, 4 males; total, 168.

In connection with this it might be mentioned that Lachnosternas occurred in large numbers this season at Gardenville and Wellington in Prince Edward County, where they have been very destructive to roots of strawberries, potatoes and other plants and in the imago state both at Trenton and Gardenville they were guilty of stripping off leaves from shrubs, raspberry canes and other fruits.

APPARATUS FOR COLLECTING SMALL ARTHROPODS TERRESTRIAL AND AQUATIC.

By Tennyson D. Jarvis, O. A. College, Guelph.

In the February number of the "Entomological News", Vol. XVII., Dr. L. O. Howard, of the Bureau of Entomology, Washington, described an apparatus, devised by Dr. Berlese, of Florence, Italy, for collecting small Arthropods and in great quantities. Being much interested in the study of Acarids our Department immediately had made an apparatus similar in structure. From it we got excellent results and a short time afterward we devised a machine for collecting aquatic insects and Acarids. We have found both collecting traps highly satisfactory. In the terrestrial trap Arthropods have been taken from many orders, but the largest numbers have been received from the Acarina, Araneida and Thysanura.

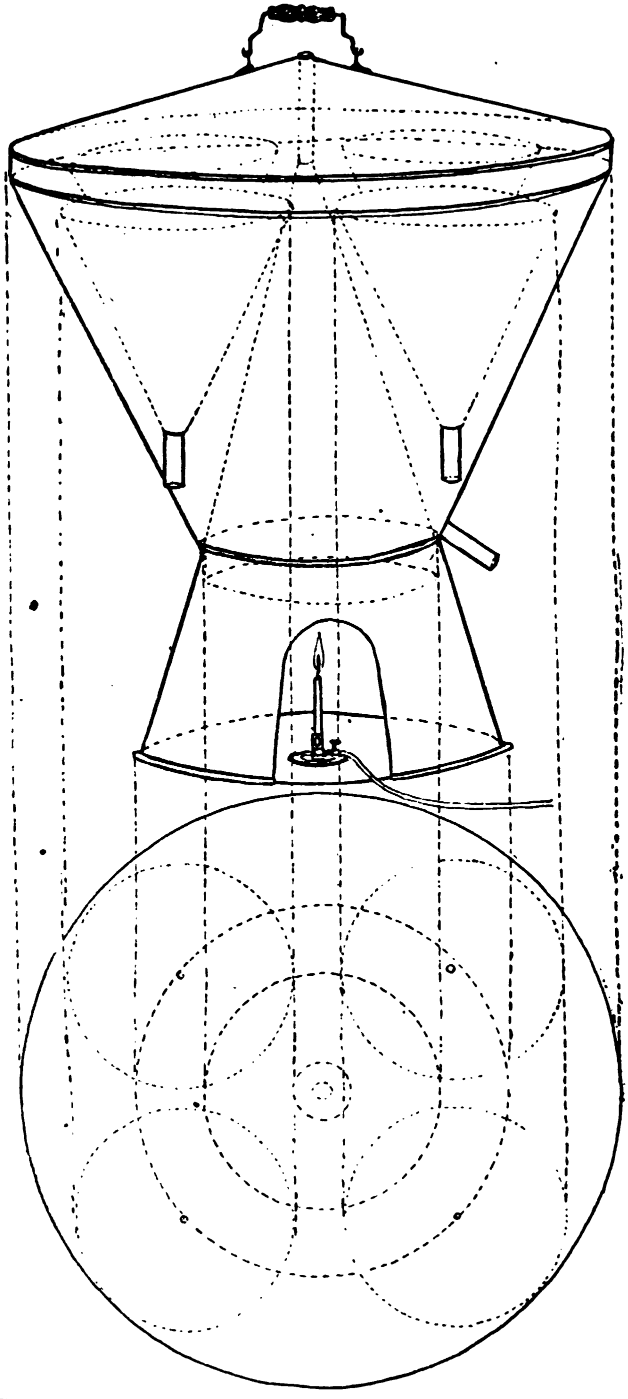


Fig 18. Apparatus for collecting small terrestrial Arthropods.

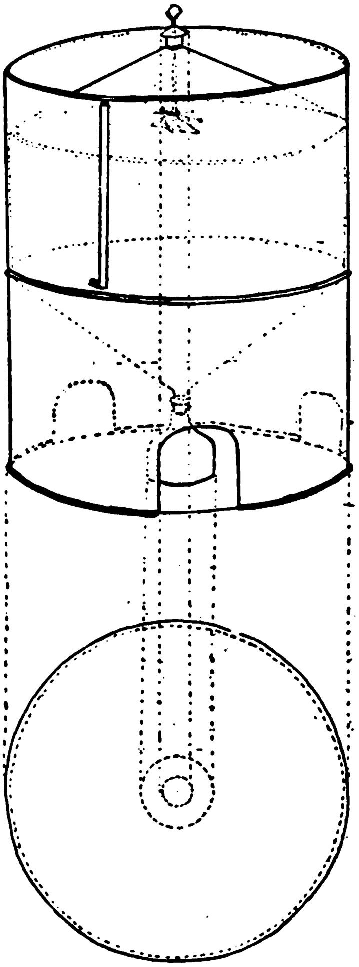


Fig. 19. Apparatus for collecting small aquatic Anthropods.

The terrestrial apparatus is made of copper, lined with tin. It consists of a central cone underneath which heat is applied. Four funnels with smooth tin lining and at the bottom of each is attached a small glass phial which may or may not contain alcohol. The funnels are surrounded by water and the water is kept hot from the gas burner below. On the top of each funnel is placed a shallow or deep tray of metallic network and on them is placed the material to be examined. The water is gradually heated and as the mites become uncomfortably hot they leave their host or other material on which they feed and travel downward into the glass tube below. If the life-history of the mite is desired, they are removed from the bottle and placed on suitable media. If the specimens are to be preserved, the tubes are usually filled with 95 per cent. alcohol or some other suitable preservative. (Figs. 18 and 19.)

A partial list of materials from which mites have been obtained is as follows:

Manure: Mites were obtained from nearly all kinds of manure and were especially abundant in horse and cow manure. From one small lot of horse manure the mites dropped down like a snow storm and filled a 4 cc. phial in a few minutes after the water was heated. Five different species were taken from this one lot.

Bark from Trees: The bark from a host of deciduous and evergreen trees were given a trial on the mite machine, and from nearly every species of tree one or more species of Acarid was taken. Many mites resemble the bark in colour or shape, on which they live, and if it were not for such a device it would mean an endless amount of waste in time and patience. A good example of this is that of a species belonging to the genus Nothrus. This mite in shape and colour resembles bits of bark or lichens.

Ensilage: A large quantity of mites were taken from ensilage from the O. A. College silo. These acarids may be largely responsible for the spread of fungus spores in the silo.

Bone: Some mites were taken from pure bone and others from bone with remnants of flesh adhering to it.

Rock: This is one of the favorite resorts of acarids. Some species evidently live on the sound rock, others on the lichens or decaying organic matter on the rock and still others take refuge in the crevices of rock. Many species were obtained from this source.

Decaying leaves, humus, soil from roots of plants, etc.: Decaying leaves is especially a very favourable resort for acarids, Some live on the decaying matter and others hibernate under the leaves.

Bulbs and Tubers: Here again nearly every kind of bulb and tuber tested yielded one or more species of mite, e.g., Potatoes, Calla Lillies, Hyacinths, Onions, etc.

Fruits: Only a few fruits were tried. The apple is the only one that responded. The mites on the apples were feeding on the wax covering the surface. The King gave the best results.

Roots and Vegetables, etc.: From beets, mangolds, turnips, artichokes, Kohl Rabi, parsnips, squash, mites were obtained.

In root houses and such places the mites carry spores of moulds on their feet and disseminate the fungus.

Moss: A few species were obtained from moss.

Nests: The nests of robins, mice, domestic fowl, were the only ones tried and from each one or more species were obtained.

Vertebrate Animals: Several animals were killed and placed on the sieve and mites were obtained from the following: young mice, mature mice, robins, groundhogs, and muskrats.

Fungi: Only a few specimens were tried. Polyporus and Boletus were infested.

Boards and Sawdust: In this case the mites were probably hiding or hibernating.

Grains: Some of the different kinds of grains that mites were obtained from were: Wheat, barley, corn, oats, mangold seed; whole and ground oats.

Decaying material: Decaying squash, parsnips, potatoes, apples, beets, Kohl Rabi and carrots all yielded mites.

Hay: From Timothy and Clover hay mites were taken.

Cones: One or two species were obtained from Pine cones.

Miscellaneous: Litter from chicken run, grass, road scrapings, living Chickweed, flowers of plants, roots of herbs, granary sweepings, decaying stumps, artichoke stubble, etc.

The aquatic apparatus is made of the same material as the terrestrial one—tin and copper. It works on the same principle as the terrestrial machine, that is when an arthropod becomes uncomfortable it goes up or down to obtain air. The Hexapods usually go up or to the surface of the water and the Arachnids go down, but instead of applying heat a few drops of formalin or alcohol is added to the aquatic material. The trap consists of a central bowl with a metallic sieve above and below. The material to be examined is placed in the bowl and enough water is added to fill the bowl to the level. When the alcohol or formalin is added the aquatic larvae go up to the top of the cone and are pulled out by a little strainer. The Acarids, etc., go down and are caught in a bottle below.

This collecting trap may be taken to a pond or lake and in a short time an immense amount of material can be obtained.

A CATALOGUE OF THE GALL INSECTS OF ONTARIO.

By Tennyson D. Jarvis, O. A. C., Guelph.

The insects which produce galls are confined to the following orders: Acarina, which are not true insects, but mites; the Diptera or flies; the Hemiptera, or bugs; the Lepidoptera, or moths and butterflies; the Coleoptera, or beetles; and the Hymenoptera, or bees, wasps, ants and sawflies.

Their food-plants cover a wide range, some twenty-six orders of plants being affected by them. Some species show a decided preference for certain groups of plants as the following table will show.

—	Acarina.	Diptera.	Hymenoptera.	Hemiptera.	Lepidoptera.	Coleoptera.
Rosaceae	13	14	17	3	......	1
Cupuliferae	13	5	22	......	......	......
Salicaceae	13	10	5	3	1	1
Urticaceae	5	7	......	6	......	......
Compositae	......	10	3	1	3	......
Juglandaceae	2	7	......	6	......	......
Sapindaceae	7	3	......	......	......	......
Vitaceae	2	5	......	......	......	......
Tiliaceae	3	2	......	1	......	......
Oleaceae	5	2	......	......	......	......
Anacardiaceae	2	......	......	1	......	......
Cornaceae	......	3	......	......	......	......
Coniferae	......	1	......	1	......	1
Geraniaceae	......	2	......	......	......	......
Gramineae	......	2	......	......	......	......
Hamamelideae	......	......	......	2	......	......
Labiateae	......	3	......	......	1	......
Araliaceae	......	1	......	......	......	......
Ericaceae	......	......	1	......	......	......
Iridaceae	......	1	......	......	......	......
Leguminosae	......	......	......	......	1	......
Magnoliaceae	......	1	......	......	......	......
Rhammaceae	......	......	......	......	1	......
Rubiaceae	1	......	......	......	......	......
Saxifragaceae	......	......	......	1	......	......
Verbenaceae	......	......	1	......	......	......
Total	61	77	49	24	7	3

ACARINA.

Family—Eriophyidæ. Gall Mites.

This is a family of microscopic mites which are quite curious and unusual in structure. They have only two pairs of legs and the abdomen is long and striated. These striations, which differ in the different species, and differ in number on the dorsal and ventral surfaces are of considerable value in classification. The galls produced vary in form, but are always open or provided with an opening through which the mites pass in and out. They are generally lined with minute hairs (trichomes) which may be simple or branched. The different types of phytoptid galls are shown below, figures 20 to 28.

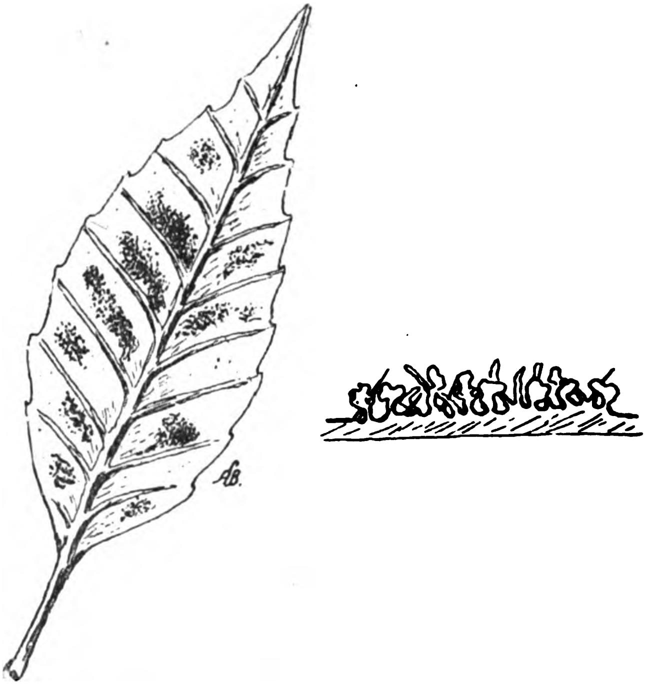


Fig. 20. Erineum on leaf of beech; natural size and highly magnified.

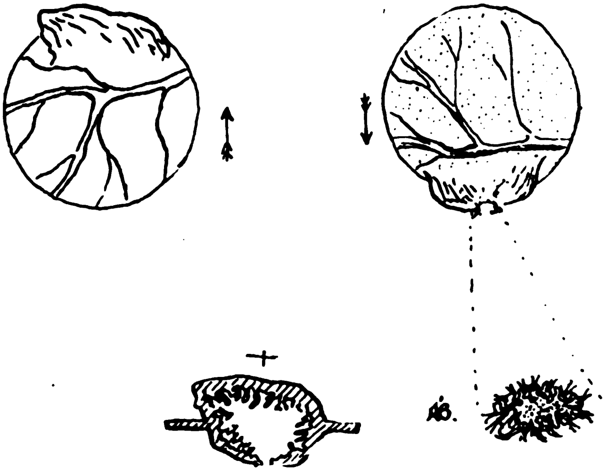


Fig. 21. Capsule Gall: Upper and lower surfaces; interior and opening of capsule, highly magnified.

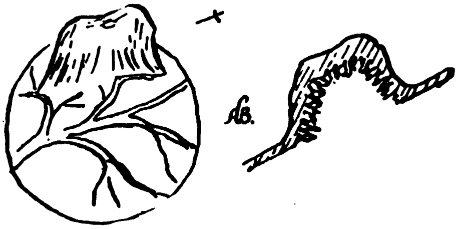


Fig. 22. Dimple Gall and section of interior greatly magnified.

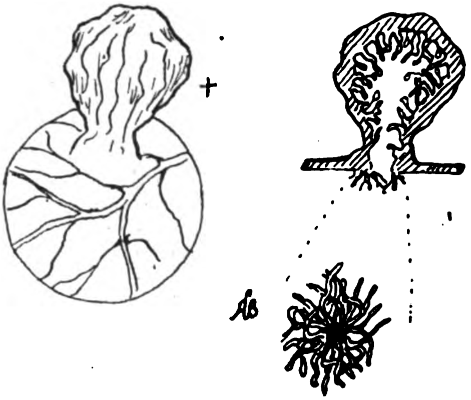


Fig. 23. Pocket Gall : Upper surface of leaf ; interior of gall, much magnified.

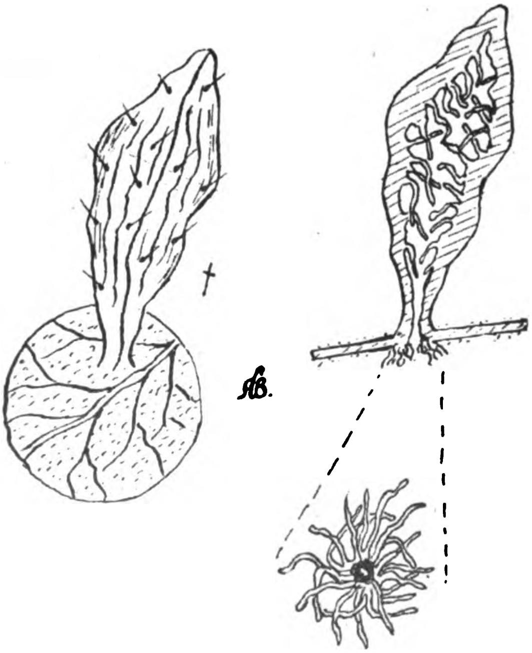


Fig. 24. Pouch Gall on upper surface of leaf ; interior of gall, much magnified.

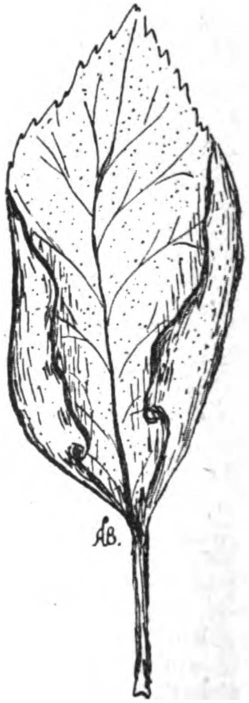


Fig. 25. Leaf-margin Gall.

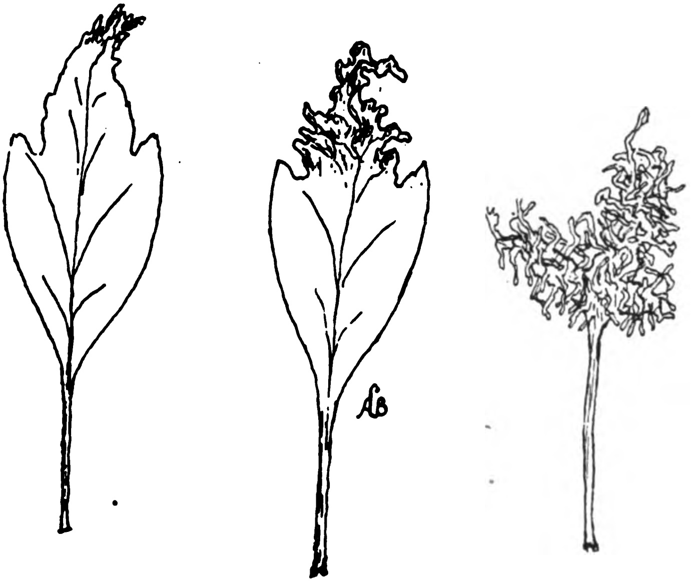


FIG. 26. Leaf-distortion Gall, different stages.

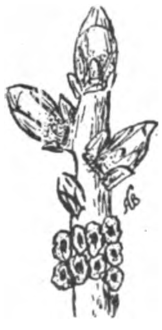


FIG. 27. Bud-like Galls.

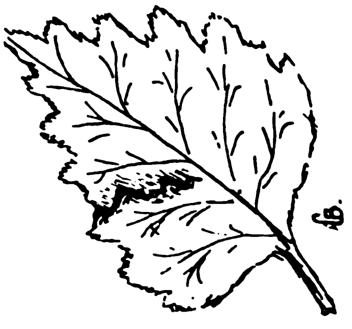


FIG 28. Serpentine Gall.

A simple apparatus, based upon the principle that most insects seek light, provides an efficient and safe method of obtaining parasites from parasitized material, rearing gall insects, etc. Figures 29 and 30.

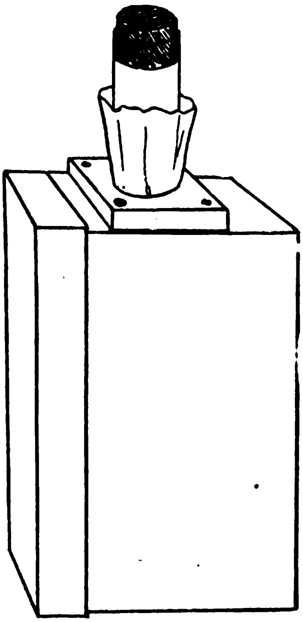


FIG. 29. Apparatus for procuring Parasites. (Side view.)

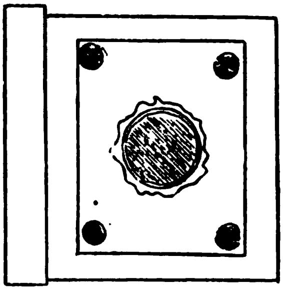


FIG. 30. Apparatus for procuring Parasites. (View from above.)

It consists of a simple cardboard box about 20 x 12 x 12 cm., upon one end of which is fixed by tacks driven through the cardboard from inside, an oblong block of wood about 9 x 7 x 1 cm. with a hole about 2.5 cm. in diameter bored through the centre of it. The cardboard behind this hole is removed neatly leaving a circular hole opening into one end of the box. Into this hole the paper cone, open at both ends, is thrust. A glass tube is thrust into the paper cone. This provides an arrangement which is quite tight and yet easy to handle. The material from which it is desired to obtain insects or parasites is placed in the box. When the insects emerge into the tube it is removed quickly and corked and another tube is put in its place. In case work is being done with very small insects a sheet of cotton cloth covered with a thin layer of cotton batting may be placed over the top of the box and the lid forced down over it, thus preventing the escape of any under the lid. When all the insects which are living have emerged, the material remaining in the boxes may be examined for dead insects.

COLEOPTERA.

Family-Buprestidæ. Metallic Wood Borers.

A few produce galls, the most important one being the Red-necked Agrilus, producing galls on the Raspberry and Blackberry.

Family-Cerambycidæ. The Long-horned Beetles.

These beetles are of medium or large size. The body is oblong or cylindrical and the antennæ are long, often longer than the body. Only one species of gall maker is known to occur in Ontario; the Willow Branch Borer *erda concolor*).

Family-Curculionidæ. The Curculios or Weevils.

In this family the head is prolonged into a beak which is sometimes longer than the remainder of the body. Specimens of the Red Pine Stem Gall (*Podapion gallicolla*) were received from Mr. A. Cosens, Toronto.

LEPIDOPTERA.

Family-Tortricidæ.

The Tortricids are generally small moths; but as a rule they are larger than the Tineids. *Ecdytolopha insiticiana* is abundant on the Honey Locust and *Eucosma Scudderiana* is common on the Goldenrod.

Family-Tineidæ. The Leaf-miners and Clothes Moths.

The family contains but few gall makers. Species Nepticula occurs on the Aspen and *Stagmatophora ceanothiella* is found at Toronto on New Jersey Tea.

Family-Gelechiidæ.

These are small moths closely related to the Tineids. Two species, belonging to the genus Gnormischema, are abundant on Solidago.

HEMIPTERA.

Family-Aphididæ. Aphids or Plant Lice.

These are small, soft-bodied insects which suck up the juices of plants and which often produce galls. The galls produced vary in form from mere leaf curls to forms of most curious appearance but of quite simple structure. They are all open or furnished with an opening. Twenty-two species of gall producers are recorded for Ontario.

Family-Psyllidæ. Jumping Plant Lice.

The members of this family resemble the preceding to a great extent, but they are not so numerous. The hind legs are formed for jumping. Only two species are so far recorded for Ontario.

DIPTERA.

Family-Cecidomyidæ. Gall Gnats.

These are very delicate, small, two-winged flies with few veins in the wings and with sucking mouth parts. The eggs are laid upon the leaf surface and the larva either feeds there, making an open gall, or makes an incision in the leaf and enters, forming a closed gall, which splits open at maturity at the point where the larva entered. The Larvæ can be readily identified by their color, which is orange, red or pink, and by the development, between the second and third segments of the body, of a peculiar, horny projection called the breast-plate, the use of which is not definitely known. Eleven genera have been recorded for Ontario.

Family-Agromyzidæ.

They are small flies closely related to the Trypetidæ. Only a few are gall makers. One species occurs on Iris and another on Salix.

Family-Trypetidæ.

This family comprises a large number of rather small flies, usually with prettily-marked wings. A few species belonging to the genus Trypeta produce galls on the stems of composites.

HYMENOPTERA.

Family-Tenthredinidæ.

Of this family the Nematinæ produce galls. The head and thorax are wide. The base of the abdomen is broadly joined to the thorax and the abdomen of the female is furnished with a pair of claws. The larvæ have from twelve to sixteen prolegs. These insects have been very thoroughly taken up by Norton in his monograph on the Nematinæ. A large number make galls on Willow.

Family-Cynipidæ. Gall Flies.

This is a family of very minute, four winged insects. In the adult gall-fly the abdomen is unusually compressed and joined to the thorax by a short peduncle, the first abdominal segment. The ovipositor is long and slender. The insect deposits its eggs within the tissues of the plant by piercing it with its ovipositor. The galls produced are closed and the insect emerges at maturity through a hole it cuts in the gall.

The writer's thanks should be here expressed to those who have so kindly assisted in the preparation of this paper. I am under special obligation to Prof. Bethune, O.A.C., Guelph; Dr. E. Porter Felt, State Entomologist, N.Y.; Mr. A. Cosens, Toronto, and Mr. W. R. Thompson, Guelph, and Mr. C. D. Jarvis, Storrs, Conn.

The present list is arranged alphabetically by host plants.

AFFECTING ALDER.

A white, frost-like erineum on under side of leaf in the axils of the veins. Trichomes dense, pellucid.—*Eriophyes* sp.—Alnus incana.

A small, red or green pubescent pocket gall on leaf. Alder Pocket Gall—*Eriophyes* sp.—Alnus incana.

A rounded gall, a deformation of the terminal bud. Alder Bud Gall.—*Dasyneura serrulatæ*—O.S. Alnus incana.

AFFECTING ASH.

Spherical, pulpy green galls about the size of a pea, springing from the upper surface of the midribs or veins. Ash Ball Gall—*Cecidomyiadæ*—Fraxinus sambucifolia.

Elongated, green, succulent galls on the under side of the leaf. Ash Midrib Gall—*Cecidomyia pellex*—O.S. Plate F., fig. 5. Fraxinus americana.

Small, irregular, smooth, more or less spherical capsule gall, protruding on both sides of the leaf. Ash Mite Gall—*Eriophyes fraxini*—Garman, Fraxinus americana.

Pinkish white, elongated capsule galls on the veins of the leaf. Ventrally the galls appear as white, hairy projections following the veins. Ash Vein Gall—*Eriophyes* sp.

A deformation of the terminal buds, their development arrested, producing a mass of small twisted leaf ends. *Eriophyes* sp.—Fraxinus americana.

Leaves dwarfed and distorted in a bundle. Resembles somewhat Cecidomyia solidaginis. Ash Bunch Gall—*Eriophyes* sp. Plate L., fig. 2. Fraxinus americana.

Small, irregular, more or less spherical capsule gall protruding on both sides of leaf. Galls hairy—*Eriophyes* sp. Fraxinus pubescens.

AFFECTING BARLEY.

A small gall forming a woody growth which fills up the cavity of the stalk and causes the joints to swell. Barley Joint-Worm Gall—*Isosoma hordei* (Harris). Hordeum vulgare.

AFFECTING BASSWOOD.

A.—*Galls on the leaves.*

Balloon-shaped galls on the upper surface of the leaf Apex of gall usually serrated. Basswood Balloon Gall—*Eriophyes abnormis* Garman—Plate I., fig. 6. Tilia americana.

Irregular, circular, dark reddish-brown spots about 4-5 mm. in diameter, having in their centre very characteristic tufts of whitish hairs. Basswood Tufted Gall. Tilia americana.

A white erineum or shallow dimple on underside of leaf, much like the Erineum on Acer negundo. *Eriophyes* sp.—Plate M., fig. 4. Tilia europea.

Small swellings about 3 mm. in diameter, protruding from both sides of the leaf. Red above and green below. Basswood Wart Gall—*Cecidomyia verrucicola*, O.S. Tilia americana.

B.—*Galls on Stem.*

Oval swellings of the cortex about 1 cm. long. Texture pith-like, surface smooth and of the same color and appearance as the bark. Basswood Egg Gall. Tilia americana.

AFFECTING BEARBERRY.

Red galls about 10 mm. long and 4. mm. broad, upon the leaves. Resulting from the folding over of the edge of the leaf or sometimes both edges, forming a pocket. Bearberry Leaf Gall—*Pemphigus Coweni* (Ckl.)—Arctostaphylos uva-ursi.

AFFECTING BEECH.

A frosty, white erineum in large patches on the under side of the leaf. Trichomes spherically capitate. *Eriophyes* sp.—Plate H., fig. 4. Fagus americana.

AFFECTING BLUE BEECH.

Fold of the leaf along the veins forming a long hollow tube. Vein Gall of Blue Beech—*Cecidomyia pudibunda*—O.S. Plate E., fig. 6. Carpinus caroliniana.

AFFECTING BIRCH.

A bud deformation, crowded and irregular, often in bunches of large size. Birch Bud Gall—*Eriophyes* sp.—Plate G., fig. 6. Betula lutea.

A rosy pink erineum in large patches on the upper side of the leaf. *Eriophyes* sp.—Betula lenta.

A yellowish-white to brownish erineum forming large patches between the ribs on the under side of the leaf. *Eriophyes* sp.—Betula papyrifera.

A transparently white, granular erineum on the surface of the leaves—*Eriophyes* sp.—Betula pumila.

A capsule gall, very small, yellow to brown. Paper Birch Capsule Gall—*Eriophyes* sp.—Plate M., fig. 5. Betula papyrifera.

A nodular pocket gall, occuring upon both faces of the leaf; yellowish or reddish to purplish. Paper Birch Pocket Gall—*Eriophyes* sp.—Plate K., fig. 1. Betula papyrifera.

AFFECTING BLUE FLAG.

An oval enlargement on the inside of the leaf, usually about 1 inch from the tip. Iris Leaf Gall—*Agromyza magnicornis* (Lowe)—Iris versicolor.

AFFECTING BONESET.

Oval swellings on the stems and leaf stalks. Boneset Stem Gall—*Choristoneura perfoliatum* (Felt)—Plate A., fig. 5. Eupatorium perfoliatum.

AFFECTING BRAMBLE.

A.—*Galls on leaves.*

Irregular-shaped, woody swellings at the base of the leaflets, or on the midrib of the Blackberry. Wood Leaf Gall—*Lasioptera farinosa* (Wm. Beutm)—Rubus villosus.

Irregular sub-conical stem galls about three-quarters of an inch in length. Blackberry Stem Gall—*Lasioptera nodulosa* (Beutm)—Rubus villosus.

B.—*Galls on stem.*

A mass of hard, small cells covered with a dense thick mass of green filaments clustered around a branch or twig of Blackberry. From 1.5 to 2 cm. in diameter. Mossy Rose Gall—Rhodites rosæ (Linn)—Plate B., fig. 1. Rubus villosus.

Large, oblong, polythalamous stem gall, 1 to 3 inches in length. Surface uneven with deep longitudinal furrows which divide the gall, more or less completely, into 4 or 5 portions. Pithy Blackberry Gall—*Diastrophus nebulosus,* O.S.—Rubus villosus.

Symmetrical swellings of the Blackberry cane. Gouty Gall *Agrilus ruficollis* (Fab.)—Rubus villosus.

Hard woody, somewhat globular, seed-like bodies 2 to 4 mm. in diameter formed in clusters on the stem. More or less covered with curved spines which are about 2 mm. long. Blackberry Seed Gall—*Diastrophus cuscutæformis* (O.S.)—Rubus villosus.

Large, reddish-brown, polythalamous, tubercular or irregular gall about 1 to 1.75 inches long and .5 inches in diameter, arising abruptly on the stem. Green in summer, darkening towards winter. Raspberry Stem Gall—*Diastrophus turgidus* (Bass)—Plate B., fig. 2. Rubus strigosus.

AFFECTING BUGLEWEED.

An elliptical or sometimes almost spherical gall formed on the stem. Bugleweed Stem Gall—*Lasioptera lycopi* (Felt)—Plate N., fig. 5. Lycopus virginicus.

AFFECTING BUTTONBUSH.

Clusters of small dimples on the upper side of the leaf, 1 to 3 mm. high. Buttonbush Dimple Gall—*Eriophyes cephalanthe* (Cook)—Plate K., fig. 5. Cephalanthus occidentalis.

AFFECTING CHESTNUT.

A small capsule gall, on the leaf, more or less spherical and 2-3 mm. in diameter. Chestnut Capsule Gall—*Eriophyes* sp.—Castanea sativa, var. americana.

AFFECTING CINQUEFOIL.

Oval or spherical galls from ¼ to ½ inch in diameter, arising in the axil of the leaves. Cinquefoil Axil Gall—*Diastrophus potentillæ* (Bass)—Plate B., fig. 5. Potentilla Canadensis.

Oval or cylindrical swellings from 1 to 2 inches long on the stems usually near the base of the plant, Monothalamous. Cinquefoil Stem Gall. Potentilla norvegica.

AFFECTING CURRANT.

Red or purple elevations or folds on the upper side of the leaf. Currant Leaf Gall—*Myzus ribis*, Linn—Ribes rubrum.

AFFECTING DANDELION.

Irregular, knotty, pithy swellings, forming oblong irregular galls along and surrounding the leaf-petiole; average length from one-quarter of an inch to fully two inches. Dandelion Petiole Gall—*Gilletia Taraxaci*, Ashmead—Taraxacum officinale.

AFFECTING DOGWOOD.

Club-shaped and about ½ to 1 inch long. On terminal twigs. Dogwood Club Gall—*Cecidomyia clavula* (Beutm.)—Cornus florida.

Thin-walled circular elevations on the under side of the leaves. Dogwood Leaf Gall—*Lasioptera corni* (Felt)—Plate A., fig. 2. Cornus florida.

Small, nearly oval Gall situated on the petiole of the leaf. Flowering Dogwood Petiole Gall. Cornus florida.

AFFECTING ELM.

A.—*Galls on the leaves.*

Round dimples in the backs of the leaves resulting in small elevations on the upper side. About 2 mm. in diameter and surrounded by an areola of lighter green. In the cavity of the gall rests a small, white larva covered with a viscid, transparent secretion. Pimple Gall—*Cecidomyiadæ*—Plate P., fig. 4. Showing larva and gall.

Ulmus americana.

A leafy growth arising from a bud and resembling the Pine Cone Willow gall but more nearly spherical and only about ½ an inch in diameter. Remains green during summer but changes to a dark brown in winter. Red Elm Bud-Gall—Plate P., fig. 6. Ulmus pubescens.

A green plum-like structure on the upper surface of the leaf. About 10 to 12 mm. in length and 3 to 7 mm. in thickness. Plum Gall—*Pemphigus ulmi fuscus*—Ulmus campestris.

There is a similar gall on Red Elm, but differing in the following respects: (1) It is twice as large. (2) The wall is a little thicker. (3) The surface is rough like the leaf not glossy. (4) The part of the leaf around the base is quite normal in appearance, showing no signs of being weakened through lack of nourishment. Ulmus pubescens.—Plate C., fig. 8.

Hollow, cock's comb-like, thin walled gall; on the upper surface of the leaf. Cockscomb Gall—*Colopha ulmicola* (Fitch)—Plate I., fig. 5. Ulmus americana.

A pulpy thickening of the tissues on the under surface of the leaf, extending for some distance along the midrib. Causes the upper surface to double on itself instead of expanding in the ordinary way. Leaf Fold Gall—*Cecidomyia ulmi* (Beutm)—Plate A., fig. 1. Ulmus americana.

Curling and gnarling of the leaves forming thereby a sort of pseudo-gall. Woolly Aphid Leaf Gall—*Schizoneura americana* (Riley)—Plate Q., fig. 1. Ulmus racemosa.

B.—*Galls on the stems.*

Aphids clustering on the limbs and trunks, causing a knotty unnatural growth of the wood. Woolly Aphid Stem-gall—*Schizoneura Rileyi* (Thomas). Ulmus americana.

Small green to yellowish pocket-galls, more or less spherical, usually on the upper side of the leaves. Elm Pocket Gall—*Eriophyes ulmi* (Garman)—Plate H., fig. 5 and 6. Ulmus americana and U. Racemosa.

An erineum on the under side of the leaf; white at first changing to brown. Trichomes simple, tangled. Rock Elm Erineum Gall—*Eriophyes* sp.—Plate H., fig. 3. Ulmus racemosa.

A very large pouch-gall on the leaves, commencing as a cone or deep dimple. *Eriophyes* sp.—Plate L., fig. 6. Ulmus pubescens.

A cone-shaped pouch gall resembling those on Tilia and much larger than Eriophyes ulmi. On the upper surface of the leaf, often very many on a single leaf but thickest along the midrib usually; shape irregular but usually tapering towards both ends and twice as long as thick, average length being about 5 mm., and average thickness about 2-2.5 mm.; color green. *Eriophyes* sp.—Plate L., fig. 5. Ulmus americana.

AFFECTING EVERGREENS.

Irregularly oblong gall, situated near the base of the needle on the new growth. Balsam Fir Needle-gall—*Cecidomyia balsamicola* (Lintner)—Plate A., fig. 3. Abies balsamea.

Oval swellings on the twigs of various species of Spruce. Spruce Gall louse—*Chermes abietis*—Picea nigra, P. excelsa and P. alba.

The gall consists of an enlargement of the smaller branches. Red Pine Stem Gall—*Podapion gallicolla* (Riley)—Pinus resinosa

AFFECTING FALSE NETTLE.

An elongate, fusiform swelling of the stalk. False Nettle Stem Gall—*Cecidomyia* (?) *bœhmeriæ* (Beutm)—Bœhmeria cylindrica.

AFFECTING GINSENG.

Spherical or irregularly cylindrical, brown galls upon the roots. Ginseng Root Gall. Aralia nudicaulis.

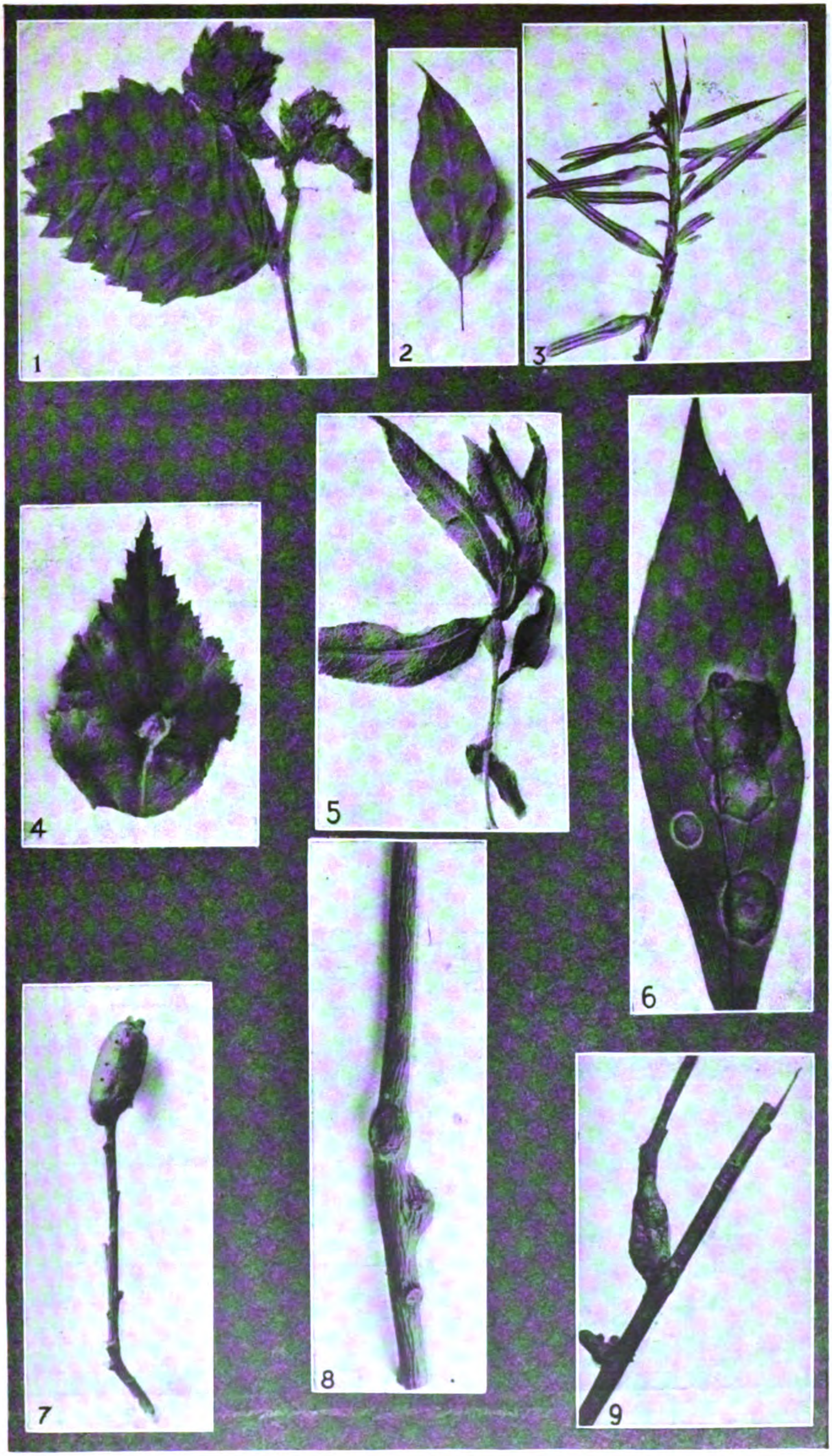


PLATE A.

1. Cecidomyia ulmi Beuten.
2. Lasioptera corni, Felt.
3. Cecidomyia balsamifera, Lintner.
4. Hormomyia cratægifolia, Felt.
5. Choristoneura perfoliata, Felt.
6. Choristoneura flavolunata, Felt.
7. Rhabdophaga batatas, O.S.
8. Agromyza æneiventris, Fallen.
9. Rhabdophaga nodulus, Walsh.

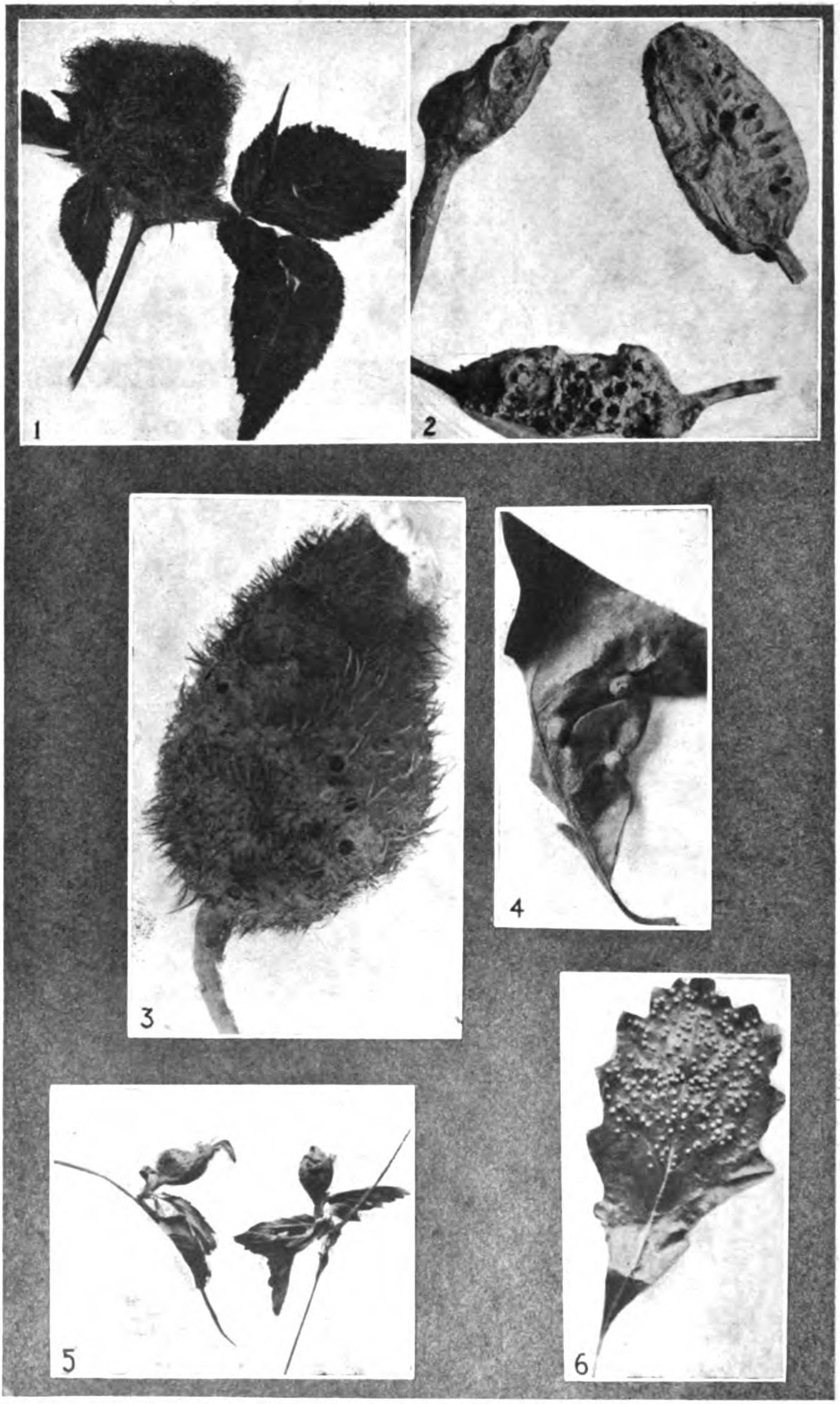
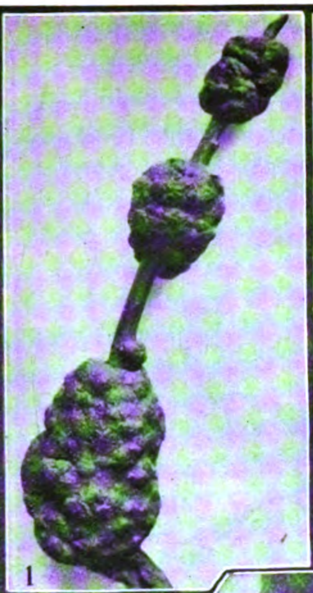
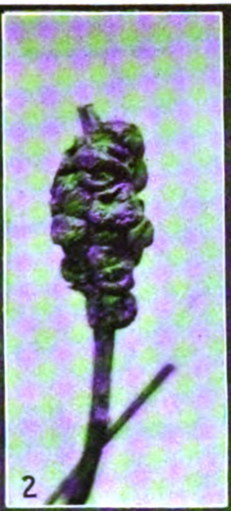
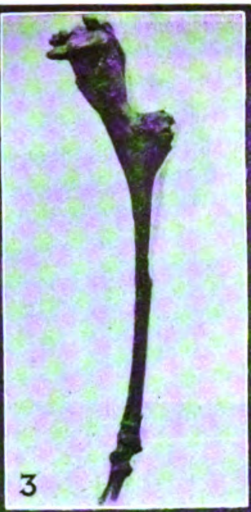


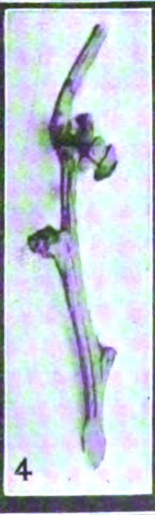
PLATE B.

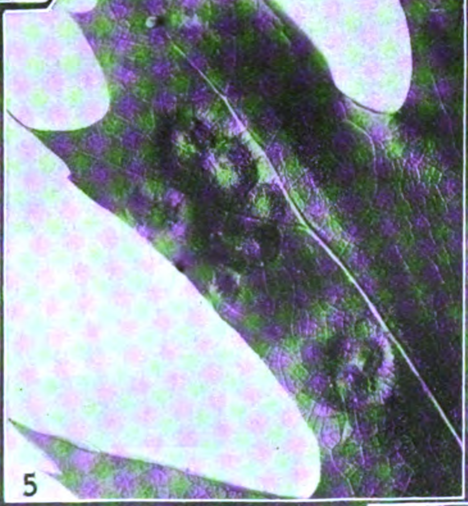
1. Rhodites rosae, Linn. on Blackberry.
2. Diastrophus turgidus, Bass.
3. Rhodites multispinosus, Gill.
4. Andricus futilis, O.S.
5. Diastrophus potentillæ, Bass.
6. Neuroterus umbilicatus, Bass.

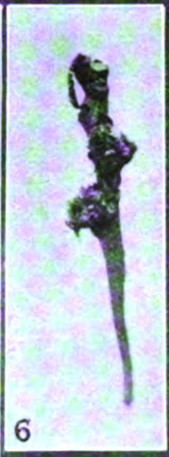


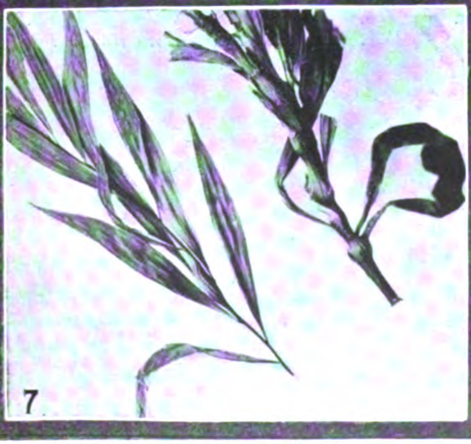












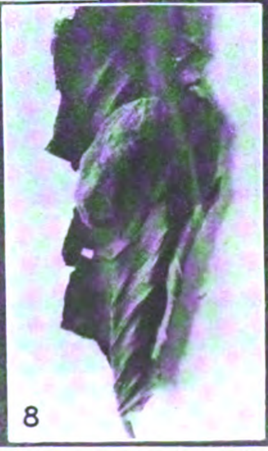


PLATE C.

1. **Andricus punctatus, Bass.**
2. **Biorhiza forticornis, Walsh.**
3. **Andricus clavula, Bass.**
4. **Cynips strobilana, O.S.**
5. **Andricus papillatus, O.S.**
6. **Andricus topiarius, Ashm.**
7. **Eucosma scudderiana, Clem.**
8. **Pemphigus ulmi-fuscus.**

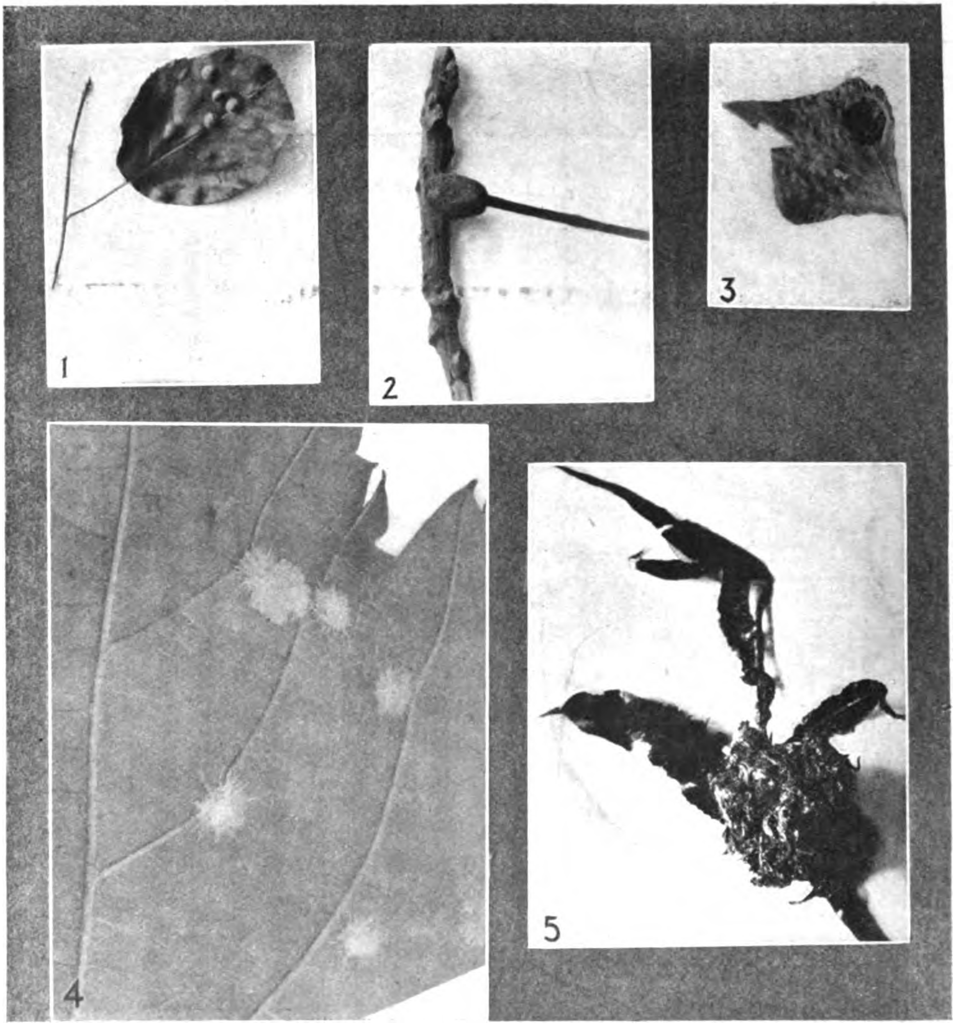
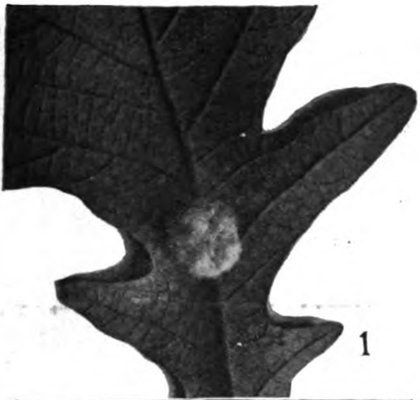


Plate D.

1. Eriophyes sp., Amelanchier Canadensis.
2. Eriophyes sp., Juglans nigra.
3. Eriophyes sp., Populus italica.
4. Eriophyes sp., Vitis cordifolia.
5. Eriophyes sp., Salix fragilis.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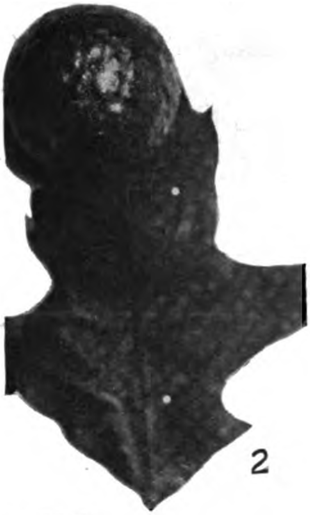
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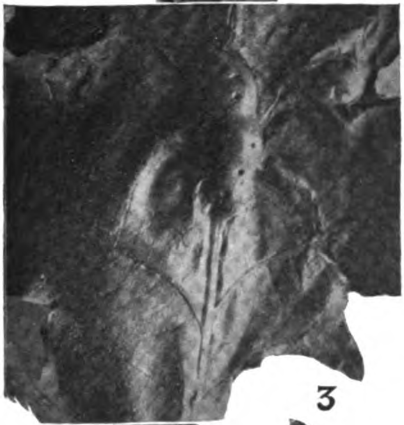
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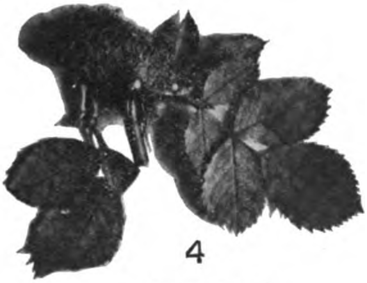
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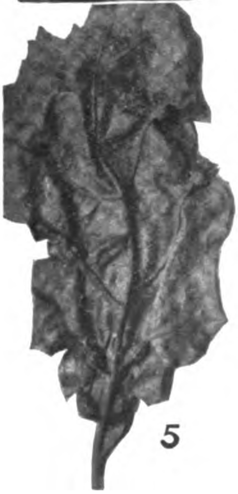
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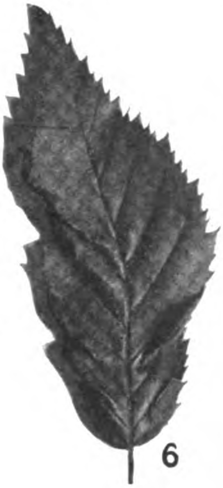
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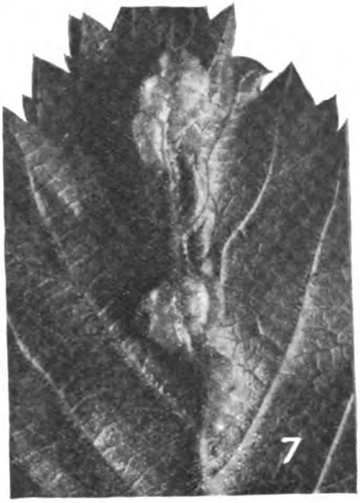
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Plate E.

1. Furry Ball Gall on Oak. (*Andricus lana.*)
2. The Larger Oak-Apple. (*Amphibolips confluentis.*)
3. Oak Midrib Gall. (*Andricus piger.*)
4. Mossy Rose Gall. (*Rhodites rosae.*)
5. Vein Gall on Oak. (*Cecidomyia quercus-majalis.*)
6. Vein Gall on Blue Beech. (*Cecidomyia pudibunda.*)
7. Virginian Creeper Midrib Gall. (*Cecidomyia sp.*)

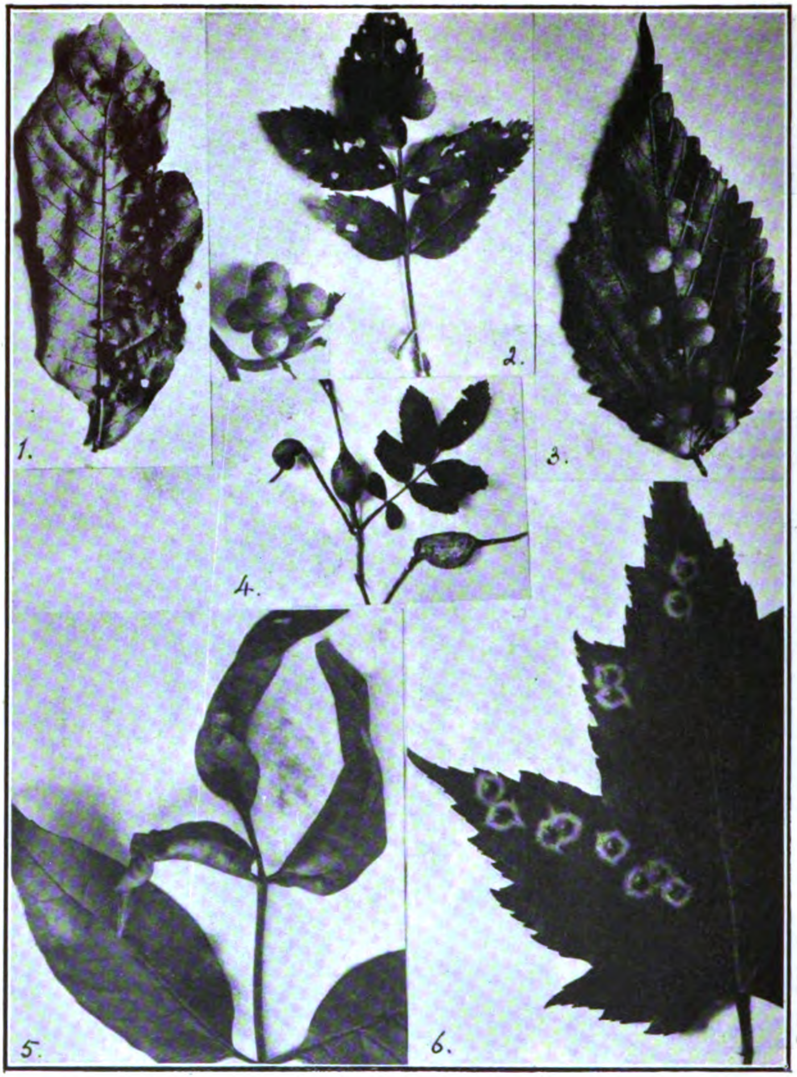
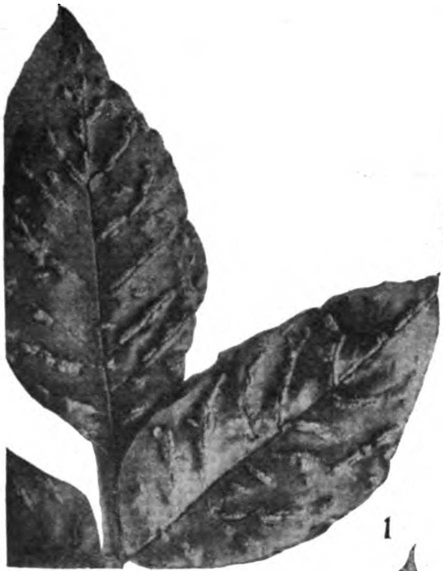


Plate F.

1. Ball Gall on Hickory. (*Diplosis caryae.*)
2. Spiny Ball Gall on Wild Rose. (*Rhodites nebulosus.*)
3. Ball Gall on Wood Nettle. (*Cecidomyia urnicola.*)
4. Rose Stem Gall. (*Rhodites globulus.*)
5. Ash Gall. *Cecidomyia pellex.*)
6. Eye Spot Gall of Maple. (*Cecidomyia ocellata.*)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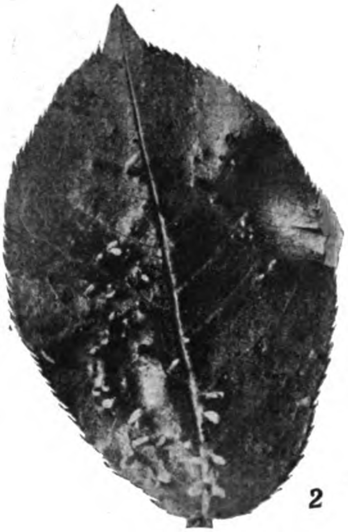
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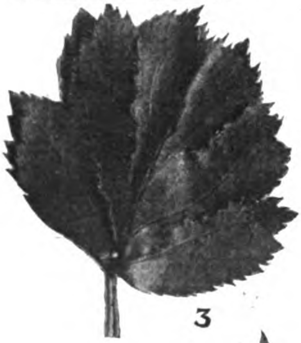
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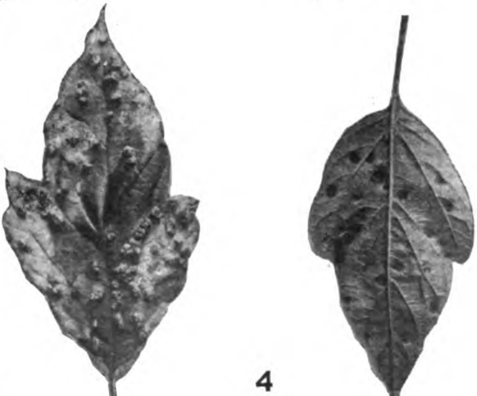
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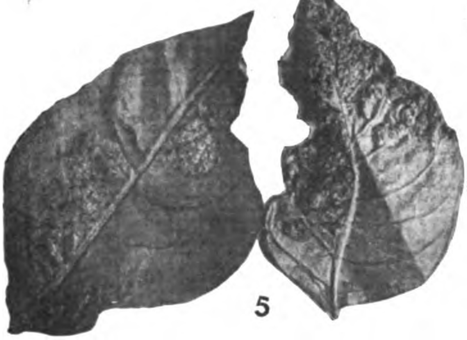
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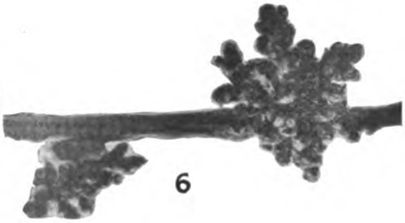
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Plate G.

1. Vein Gall on White Ash. *Eriophyes sp.*
2. Chokecherry Mite Gall. *Eriophyes. sp.*
3. Hawthorn Serpentine Gall. *Eriophyes sp.*
4. Manitoba Maple Wart Gall. *Eriophyes sp.*
5. Poison Ivy Mite Gall. *Eriophyes sp.*
6. Birch Bud-Gall. *Eriophyes sp.*

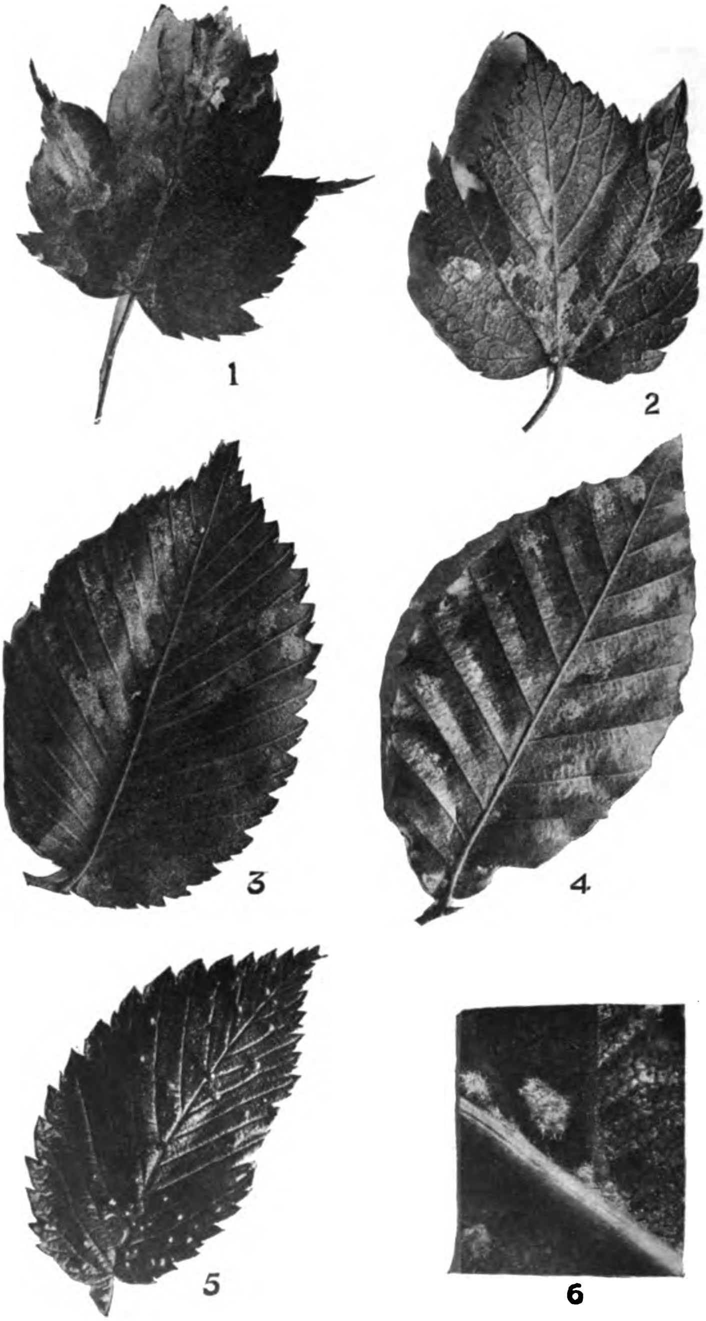

Plate H.

1. Sugar Maple Pink frost-gall. *Eriophyes sp.*
2. Mountain Maple frost-gall. *Eriophyes sp.*
3. Rock Elm frost-gall. *Eriophyes sp.*
4. Beech frost-gall. *Eriophyes sp.*
5. Elm mite gall. *Eriophyes ulmi.*
6. Elm mite gall. Enlarged opening on under surface.

AFFECTING GOLDENROD.

A.—*Galls on leaves.*

Circular or somewhat irregularly elliptical, spot-like galls, only projecting very slightly from each side of the leaf. The main part of the spot is light colored, this being enclosed by a dark ring giving it some resemblance to an eye. Lunate Marginal Gall—*Choristoneura flavolunata* (Felt)—Plate A., fig. 6. Solidago Canadensis.

Small, oblong, or seed-like galls, light green in color, on the lower surface of the leaves. Seed Gall. Solidago Canadensis.

Conical leafy structure ½ to 1½ inches high and ½ inch in diameter. Between the thickened parts of the leaflets live from one to many, small, orange coloured larvæ. Terminal Gall—*Asphondylia monacha* (O.S.)—Solidago Canadensis.

Leaves thickened and folded lengthwise, somewhat like a pod; green or red in colour. Leaf-fold Gall—*Chaitophorous* sp. (undescribed)—Solidago Canadensis.

B.—*Galls on the stems.*

Large, elongated, monothalamous gall with a very large larval chamber situated on the stem below the branches. Elliptical Gall—*Gnorimoschema, gallæsolidaginis* (Riley).

Spindle-shaped galls about 3 cm. in length. Situated high up on the stem on the main axis of the plant among the branches, often causing some of these to abort. It passes the winter in the larval stage. Goldenrod Spindle Gall—*Eucosma Scudderiana* (Clemens)—Plate J., fig. 2. Solidago Canadensis.

Elliptical, hollow gall, 1.25 inches in length, .48 of an inch in diameter, the diameter of the plug .08 of an inch. The galls are found a short distance above the ground.—Gnormischema gallæisterella (Kell). Solidago Canadensis.

Apical, bunch-like galls produced by the arrest of growth in the stalk, which causes the leaves to accumulate. Bunch Gall—*Cecidomyia solidaginis* (Loew)—Solidago Canadensis.

Globular, ball-like enlargement about 1 inch in diameter. Ball Gall—*Trypeta solidaginis* (Fitch)—Plate J., fig. 3. Solidago Canadensis.

Consists of small bunch of accumulated aborted leaves about ½ inch in length. Cylindrical Bunch Gall—*Trypeta polita* (Loew)—Solidago Canadensis.

C.—*Galls in flower stalk.*

Bud-shaped, green galls, which are larger and stouter than the normal buds. Bud Gall—*Cecidomyia racemicola* (O.S.)—Solidago Canadensis.

AFFECTING GOOSEBERRY.

An irregular or rounded cluster of bud-like galls arising from a spherical receptacle on the stem. Gooseberry Bud Gall. Plate O., fig. 6. *Ribes cynosbati.*

AFFECTING GRAPE.

A.—*Galls on leaves.*

A white erineum on the underside of the leaf. Trichomes simple. *Eriophyes sp.*—Plate L., fig. 4. Wild Grape.

Small, semi-circular or nearly circular capsules along the veins, about 2 mm. in diameter and but slightly elevated on either surface of the leaf. On upper surface paler than the leaf, below, with a white nipple surrounded by a furrow. *Eriophyes* sp.—Vitis cordifolia.

Small, rough galls usually on the upper surface of the leaf. The galls are very numerous, and frequently the leaves are absolutely covered with them. Grape phylloxera—*Phylloxera vastatrix* (Planchon)—Vitis sp.

Elongated, conical, red galls, .7-1 cm. in length usually on the upper side of the leaves. Grape Vine Tube Gall—*Cecidomyia viticola* (O.S.)—Plate O., fig. 1. Vitis sp.

Irregular, soft and succulent swellings on stems and leaf-stalks of Grapes; yellow green or red in color. Grape-vine Tomato Gall—*Lasioptera vitis* (O.S.)—Vitis sp.

Oval, red swellings of the petiole. About ½ inch long and ¼ of an inch in diameter. Grape Petiole Gall—Vitis cordifolia.

B.—*Galls on Stems.*

Rounded galls flattened at the base and jointed at the top. On the stems of Wild Grapes. Grape-vine Apple Gall—*Cecidomyia vitis-pomum* (Walsh & Riley).

AFFECTING HACKBERRY.

A witch-broom gall on branches and twigs. Hackberry Witch-broom Gall—*Eriophyes* sp.—Celtis occidentalis.

A woody gall with bluntly-rounded apex and slightly constricted at the point of attachment to the leaf. Opposite the gall is a concave depression. Hackberry Nipple Gall—*Pachypsylla celtidis-mammæ* (Riley)—Celtis occidentalis.

Circular spot-like gall on the under side of the leaf with a small nipple in the middle. Hackberry Blister Gall—*Pachypsylla celtidis-vesiculum* (Riley)—Celtis occidentalis.

AFFECTING HAWTHORN.

A fold of the leaf making long, irregular, wavy projections on the upper surface of the leaf. From the midrib to the edge of the leaf is the general direction of the gall. Serpentine Gall—*Acarus cratægi vermiculus*—Plate G., fig. 3. Cratægus sp.

Small, round swellings (capsules) protruding very slightly on both sides of the leaf. About .5-1 mm. in diameter. Galls very numerous where they occur—sometimes more than 100 on a single leaf. Speck Gall—*Eriophyes* sp.—Cratægus sp.

These tiny oval galls can be easily recognized from their peculiar habit of arranging themselves all around the margins of the leaf, thus forming a sort of border for it. They are often so numerous that there is one for each serration. Each gall is about 2 mm. long, 1 mm. wide, and about 5 mm. thick. It extends about equally beyond both surfaces of the leaf and is of much the same texture as the leaf itself, except that towards the apex both it and the apex of the serration on which it is situated tend to become brown. In this brown part there is a small aperture. The gall is monothalamous, and contains a single, yellowish white, short, fat larva, which on July 31st had not yet begun to pupate. Hawthorn Leaf-border Gall—Plate N., fig. 7. Cratægus sp.

Small red, pod-shaped structures slightly tapering towards one end on the upper surface of the leaf. From 5-8 mm. long and about 2 mm. wide. Pod Gall—*Cecidomyidæ*—Cratægus sp.

Tiny, oval structures arranged around the margin of the leaf. Often so numerous that there is one for each serration. Leaf-border-Gall *Cecidomyia* Cratægus sp.

Green or pink, globular, bladder-like structures on the under surface of the leaf. About 5 mm. in diameter. Bladder Gall—*Cecidomyidæ*—Plate O., fig. 5. Cratægus sp.

Very small, monothalamous, conical structures, 1 to 2 mm. high and 1,1.5 mm. wide at the base; formed anywhere on either surface of the leaf and sometimes on the stem of young twigs. Cone Gall —*Eriophyes*—Cratægus sp.

Cylindrical structures, hollow, red or green in color, about 3 mm. in height and diameter and with a hole in the top. Top of gall thickly set with spines. Burr Gall—*Cecidomyia bedeguar,* O.S.—Plate O., fig. 3. Cratægus sp.

Cock's comb-like structure on the upper surface of the leaf. Cock's Comb Hawthorn Gall—*Hormomyia cratægifolia* (Felt)—Plate A., fig. 4. Cratægus sp.

Leaf slightly thickened, purplish in color and rolled in upon itself, the under surface being the one enclosed. Wooly Aphid Gall (*Schizoneura*)—Cratægus sp.

AFFECTING HELIANTHUS.

Globular gall about ½ an inch in diameter on the leaves. Helianthus Ball Gall—*Cecidomyia bulla* (Walsh)—Helianthus divaricatus and H. Strimosus.

Linear-shaped galls in clusters on the stem. *Cecidomyia helianthi* (Brodie)—Helianthus divaricatus and H. strimosus.

AFFECTING HAZEL.

This gall is found only along the main veins of the leaf. The part of the leaf round the affected portion of the vein become crimped, the crimps all radiating towards the vein as a common centre.. Hazel Leaf Crimp Gall (Undescribed)—Corylus americana.

A bud deformation, which attacks bud as soon as it expands, and checks its subsequent development. Hazelnut Bud Gall—*Eriophyes avellanæ*—Corylus americana.

AFFECTING HICKORY

A.—*Galls on leaves.*

Flattened, circular, yellow or whitish galls, an inch in diameter. Hickory Button Gall—*Phylloxera fovela*—Plate N., fig.1. Carya glabra.

Red, elongated galls, consisting of a fold of the main veins running from the midrib to the edge of the leaf. Hickory Vein Gall—*Phylloxera caryævenæ*—Carya Glabra.

Cone-shaped gall about 3 mm. in diameter, on the upper side of the leaf. Green in color; the opening on the lower surface is fringed with hairs. Hickory Cone Aphid-Gall—*Phylloxera caryæfallax*—Plate I., fig. 4. Carya ovata.

Hemispherical gall on the upper surface of the leaf, opening on the under surface by means of a narrow slit, ⅛ to ¼ of an inch in diameter. Hickory Hemispherical Gall Phylloxera caryæ-globuli—*Dactylosyhæra hemispæricum*—Carya alba.

Expansion of the young fruit or ovary to two or three times the size of the normal fruit. The centre of the gall is filled with Aphids. Fruit Gall--*Phylloxera* (undescribed)—Carya ovata.

Conical or sometimes almost spherical, red or purplish gall on the under surface of the leaf along the veins. Hickory Cone Gall—*Cecidomyia sanguinolenta* (O.S.)—Carya ovata.

Smooth and rounded, with a fine elongated tip, 5 to 6 mm. in height and 2 to 3 mm. in greatest diameter. Pale green, turning brown in autumn on the under surface of the leaves. Hickory Seed Gall—*Cecidomyia caryæcola* (O.S.)—Carya ovata.

Sub-globular, pubescent, onion-shaped gall on the under side of the leaves. The pubescence is pale when gall is young and rose-coloured when mature. Hickory Onion Gall—*Cecidomyia holotricha* (O.S.)—Plate R., fig. 6. Hicoria ovata.

Narrow, cylindrical, tube-like gall, on the under side of the leaves. Green when immature becoming brown or blackish when ripe. Hickory Tube Gall—*Cecidomyia tubicola*—Carya alba.

Rounded, brownish, downy gall on the under side of the leaves. Resembles somewhat a diminutive peach. About ⅛ to 1/5 of an inch in diameter. Hickory Peach Gall—*Cecidomyia persicoides*—Carya ovata.

Large, irregular knobs all over the husk of the nut containing thick-walled cells. Hickory Nut Gall—*Cecidomyia caryænucicola*—Carya alba.

Thin-walled galls about 3 mm. in diameter, hard and brittle, attached to the under side of the leaves by a projection at the base which appears on the upper side as a black dot surrounded by a light yellow areola. Hickory Ball Gall—*Doplosis caryæ*—Plate F., fig.1. Carya ovata.

B.—*Galls on Stems.*

Large, globular or hickory-nut shaped galls on the stem, petiole or midrib of the leaf. Variable in size. Hickory Aphid Gall—*Phylloxera caryæcaulis* (Fitch)—Carya ovata.

Affecting Horse-Balm.

An inverted, pear-shaped gall much resembling the gall in the Wood Nettle. The large end is weakly attached to a vein on the underside of the leaf. Horse-balm Leaf Gall—*Cecidomyia collinsoniæ* (Beutm)—Plate O., fig. 4.

Affecting Huckleberry.

Rounded or elongated galls 1-2 cm. in diameter on the stem of the Huckleberry. Huckleberry Gall—*Solenogopheria vacinii* (Ashm)—Gaylussacia resinosa.

Affecting Genus Juglans.

The Walnut and Butternut.

A brown, velvety erineum surrounding the leaf stalks, or on the main veins, causing a swelling or bending of the stalk or vein. Walnut Cushion Gall—*Eriophyes* sp.—Plate D., fig. 2. Juglans nigra and probably J. cinerea.

A green pocket-gall on the upper side (usually) of the leaf. Walnut "Wart" Gall—*Eriophyes* sp.—Juglans nigra and probably J. cinerea.

Affecting Juneberry.

Small nearly globular, dark brown, pocket galls, averaging 2 mm. in diameter, singly or in clusters on the upper side of the leaf. Juneberry Ball Gall—*Eriophyes* sp.—Plate D., fig. 1. Amelanchier rotundifolia.

Affecting Locust.

Oval swellings on the branches and twigs, generally occurring at the junction of the leaf petiole with the branch. Locust Twig Borer—*Ecdytolopha insiticiana*—Gleditschia triacanthos.

Affecting Maple.

A whitish frost-like erineum with scattered spots of rosy pink, on the upper surface of the leaf, sometimes nearly covering it. *Eriophyes* sp.—Plate H., fig. 1. Acer rubrum.

A pale yellow or white erineum on the under side of the leaf. Trichomes capitate. *Eriophyes* sp.—Acer saccharinum.

A nearly spherical pocket gall on the upper surface of the leaf, varying from light green through red or purple to black. *Phlœcoptes quadripes*—Plate J., fig. 1. Acer saccharinum.

A white or whitish erineum in patches on the under side of the leaf, often limited by the veins. Trichomes capitate. When old the trichomes assume a brown color. *Eriophyes* sp.—Acer saccharum.

A green, reddish or purplish, slender, pouch-gall projecting from the upper surface of the leaf. *Phlœcoptes aceris*—Plate M., fig. 6. Acer saccharum.

A white or whitish erineum in patches on the under side of the leaf. *Eriophyes* sp.—Acer nigrum.

Irregular wart-like swellings (Dimple) on the upper surface of the leaf. The swellings are green at first and turn gray when mature. The average diameter is about 3 mm. Manitoba Maple Wart Gall—*Eriophyes* sp.—Plate G., fig. 4. Acer negundo.

A white, whitish, or pale yellow erineum on the under side of the leaf, in patches often in the axils of the veins. Trichomes long, tangled and distorted.—*Eriophyes* sp.—Plate H., fig. 2, Acer spicatum.

Target-like, circular, flat galls on the leaves of Red Maple, Eye-spot Gall of Maple—*Cecidomyia ocellata*, O.S.—Plate F. fig. 6. Acer sp.

Swellings on the midrib of the leaflets much resembling the Ash Midrib Gall, Manitoba Maple Midrib Gall—*Cecidomyia negundinis* (Gillette.) Acer negundo.

Irregularly elliptical swellings along the veins of the leaves of Hard Maple, red, green or yellow in colour. Hard Maple Leaf-vein Gall—*Cecidomyid* sp.—Plate P. fig. 1. Acer saccharum.

Affecting Muhlenbergia.

Bud galls with very much enlarged glumes. Muhlenbergia Bud Gall—Lasioptera muhlenbergiæ (Naster) Muhlenbergia glomerata.

Affecting New Jersey Tea.

A terminal, spindle-shaped enlargement of the stem, 10-15 mm. long. New Jersey Tea Stem Gall—*Stagmatophora ceanothiella* (Cosens)—Ceanothus americanus.

Affecting Oak.

An irregular dimple upon the blade of the leaf. From beneath it appears as an irregular concavity, lined with a tangled mass of white vegetable hairs. Oak Dimple Gall—*Euriophyes querci*—Plate L. fig. 3. Quercus macrocarpa.

A dense mat of brown hairs growing in large patches upon the under sides of the leaves. Oak Hair Gall—*Eriophyes* sp.—(Undescribed)—Quercus sp.

A dense, white pubescence upon the under side of the leaves causing a distortion and folding of leaf blade. The pubescence is inside the fold, forming the lining of the gall. Oak Fold Gall—*Cecidomyia Niveipila,* O.S. Quercus rubra.

Green or brown, narrowly oval, inflated galls produced along the veins on the under side of the leaves. The surface of the gall is netted with veins. Oak Vein Gall—*Cecidomyia quercus majalis* O.S.—Plate E., fig. 5. Quercus rubra.

Pale red, saucer-shaped galls in clusters on the under surface of the leaf. Oak Spangles—*Cecidomyia poculum* O.S. Quercus alba.

Small, bright red galls, joined to the leaf by a small portion of the surface, so that they are easily detached without injuring the leaf. The surface of the gall is netted with innumerable fissures between which are small elevations with very short spines. When on the under side of the leaf, the gall is white in color. Oak—*Acraspis macrocarpa*—Quercus macrocarpa.

White, furry, hemispherical mass varying from 4-11 mm. in diameter. This is composed of innumerable fine, woody fibres to which are attached small, round kernels. The Larger Furry Ball Gall—*Andricus lana*—Plate E., fig. 1. Quercus macrocarpa.

Small, button-like enlargements upon the upper and lower surfaces of the leaves. Button Gall—*Neuroterus umbilicatus* (Bass)—Plate B., fig. 6. Quercus macrocarpa.

Small, dithalamous, pea-shaped gall on the upper side of the leaf. The surface is fissured or netted with depressions between which are elevations. Oak Pea Gall—*Cynips Pisum*—Quercus alba and macrocarpa.

Hard, woody gall occurring on midrib or petiole. Green or red in color and more or less roughened on the surface. Oak Petiole Gall—*Andricus petiolicola.*

Large globular gall about 4 cm. in diameter. Exterior surface smooth and somewhat irregular. Interior filled with a spongy mass of fibres, very loosely attached to the wall of the chamber. The Larger Oak Apple Gall—*Amphibolips confluentis,* (Harr.)—Plate E., fig. 2.

Small. pale-green, wart-like gall situated in the parenchyma of the leaf and protruding beyond both surfaces but chiefly beyond the lower. Inside are two or three seed-like, oblong kernels, kept in position by white filaments. Oak Wart Gall—*Andricus futilis,* O.S.—Plate B. fig. 4. Quercus macrocarpa.

Round or oval galls growing on the midrib of the leaf. The gall is white or yellowish and covered with fine bright pink or red spines about 1-2 mm. in length. Oak Hedgehog Gall—*Acraspis crinacei*—Plate R. fig. 1. Quercus alba.

Small spherical gall about 3 mm. in diameter upon the veins of the leaves upon the under side of the leaf. It is thickly covered with fine short hair which forms a cushion all around it. Oak Furry Ball Gall—*Neuroterus floccosus*—Plate R. fig. 2. Quercus alba.

Large, smooth, spherical galls from 2-3 cm. in diameter occurring on the under side of the leaves. The small, spherical, larval cell within the cavity is held in position by a comparatively small number of filaments which radiate from it to the surrounding walls. Empty Oak Apple Gall—*Amphibolips inanis* (O.S.). Quercus rubra.

Somewhat circular, about 4 mm. in diameter, projecting on both sides of the leaf. Above dark red, below yellowish, about three times the thickness of the leaf. Oak—*Andicus papillatus* O.S.—Plate C. fig. 5. Quercus rubra.

Irregular woody swellings of the midrib about 7-8 inch in length, surface is glabrous or slightly pubescent and projects on both sides of the leaf. Oak Midrib Gall—*Andricus pige*—Plate E. fig. 3.

Globular, hollow gall, nearly always at the outer edge of the leaf blade. From .9-1 cm. in diameter and comparatively thin walled. Oak Apple Gall—*Andricus singularis* (Bass.) Quercus rubra.

Cluster of dense, narrow leaflets, springing from a bud. Oak Leafy-wreath Gall—*Andricus topiarius* (Ashm).—Plate C. fig. 6. Quercus macrocarpa.

B.—*Galls on stem.*

Spherical gall, hard and woody with a small cavity in the centre. A short joint at the apex distinguishes this species from Globulus. Pointed Bullet Gall—*Holcaspis duricaria* (Bass.) Quercus macrocarpa.

Hard, conical galls occurring in numbers on the stems. Oak Cone Gall—*Andricus ventricosus* (Bass.)—Plate R. fig. 3. Quercus sp.

Small, soft, bladder-like, one-celled structures, each about 1-3 of an inch in diameter. Arranged in a cylindrical cluster along the stem of the branches. Oak Fig Gall—*Biorhiza forticornis* (Walsh)—Plate C. fig. 2. Quercus alba.

Rosette or head of hard, brown, nut-like, wedge-shaped structures fitting closely to one another and attached at the base to a small, spherical receptacle about ¼-1-3 of an inch in diameter. Pine-cone Oak Gall—*Cynips strobilana* (O.S.)—Plate C. fig. 4. Quercus macrocarpa.

Irregularly oval, woody gall encircling the stem. Polythalamous, containing many cream-colored cases attached to the twig, each case looking very much like an oat seed. Oak Seed Gall—*Andricus seminator* (Harr.)—Quercus alba.

Rough, hard, woody, somewhat globular, knot-like gall, encircling the stem and varying greatly in size, but commonly 1-2 inches in diameter. Oak Knot Gall—*Andricus Punctatus* (Bass.)—Plate C. fig. 1. Quercus coccinea.

Bullet-like, corky gall with a small cavity in the centre. On stem of Burr Oak and White Oak. Oak Bullet Gall—*Holcaspis globulus* (Fitch). Quercus macrocarpa and Q. alba.

Club-shaped, hard and woody with often a few leaves growing from it. ½ to 1 inch in length. Club Gall—*Andricus clavula* (Bass.)—Plate C. fig. 3.

Affecting Poplar.

A. Galls on the leaves.

Small, circular, pimple-like elevations on the upper surface of the leaf, with a corresponding depression on the lower surface. Pimple Gall. (Plate P. fig. 3.)—Populus balsamifera.

Leaf folded at its edge to form a red or green pouch over the gall which is narrow and tent-shaped, and is formed from the leaf surface. Aspen Tent Gall—Plate P. fig. 2. Populus tremuloides.

Oblong enlargements of the petiole close to the base of the leaf. *Nepticula* sp.—Populus tremuloides.

Pear-shaped, monothalamous galls growing on the upper side of the leaf and joined to the leaf by a slight constriction. Aspen Ball Gall—Plate P. fig. 5.—Populus tremuloides.

Large, irregular galls on the tips of the twigs, consisting of a double row of lamina; between these two layers are large numbers of aphids. Vagabond Gall—*Pemphigus vagabundus*—Populus deltoides.

Irregular, spherical gall developed at the junction of the petiole and blade of leaf. Poplar Petiole Gall—*Pemphigus populicaulis*—Plate I. fig. 3. Populus deltoides.

Circular, flat or slightly convex, frost-like patches varying from 2-3 mm. in diameter; on the upper side of the leaf. Large-toothed Aspen Frost Gall—*Eriophyes* sp.—Populus grandidentata.

Circular depressions dimple always on the lower side of the leaf. On the upper side it appears as a green red circular elevation. Large-toothed Aspen Convex Gall—*Eriophyes* sp.—Plate M. fig. 1 & 2. Populus grandidentata.

Dimple-like galls on the upper side of the leaf of the Aspen. Aspen Dimple Gall—*Eriophyses* sp.—Plate M. fig. 3. Populus tremuloides.

Irregular, warty protuberances on the midrib or other veins of the leaf and extending beyond both surfaces but chiefly the upper one. Large-toothed Aspen Vein Gall. Populus grandidentata.

Irregular tubercular masses of closely-packed small reddish-green protuberances on the stem. Unsightly Poplar Gall—*Eriophyes* sp. Populus tremuloides.

A depression on the lower surface of the leaf, 4-12 mm. in diameter and 2-5 mm. in depth. Under surface of gall is orange yellow—*Eriophyes* sp. —Plate D., fig. 3. Populus italica.

Margin of leaf distorted and curled. *Eriophyes* sp.—Plate T., fig. 1. Populus tremuloides.

B.—*Galls on the stem.*

Irregular swellings caused by a species of Woolly Aphis, on the smaller branches and twigs of the Cottonwood. Woolly Aphid Stem Gall—*Schizoneura* sp. Populus deltoides.

Irregularly oval, about 1-3 to ½ inch long, smooth and about the same color as the bark. Usually on one side of a branch but sometimes nearly encircling it. Aspen Egg Gall—*Agronyzaaoneiventris* (Fallen).—Plate A., fig. 8. Populus tremuloides.

AFFECTING GENUS PRUNUS.

Reddish, slender pouch-galls, somewhat irregular and pubescent, 3-4 mm. long and .5-1 mm. in diameter. Pin Cherry Pouch Gall—*Eriophyes* sp. Prunus pennsylvanica.

Green or rosy-red pouch gal on the upper side of the leaf, .5-6 cm. in length. The gall is constricted about half way to the leaf. Black Cherry Pouch Gall—*Eriophyes* sp. Prunus serrotina.

Green or reddish pouch gall on the upper side of the leaf, differing from the Black Cherry Pouch Gall in that the aperture is not funnel-shaped. Choke Cherry Pouch Gall—*Eriophyes* sp.—Plate G., fig. 2. Prunus virginiana.

A very long, slender pouch-gall, green or whitish on either side of the leaf. Wild Plum Pouch Gall—*Eriophyes* sp.—Plate K., fig. 2. Prunus americana.

A tubercular growth, encircling base of buds and shoots. Plum Bud Gall—*Eriophyes phloeocoptes*. Prunus domestica.

A club-shaped, monothalamous gall with one or two leaves growing from its side. The gall is an enlargement of the terminal buds of young shoots. Black Cherry Bud Gall—*Cecidomyia serotinae.* Prunus Serotina.

A malformation of the fruit. The pit or stone is absent and the fruit is enlarged, forming a thick walled pouch about 1 cm. in length by 5 mm. in width. Chokecherry Pocket Gall—*Cecidomyia virginiana.* Prunus virginiana.

AFFECTING GENUS PYRUS.

Apple, Crab Apple, Pear and Chokeberry.

Dimple galls, with the concavity on the upper surface of the leaf. Internal surface corrugated. Apple Dimple Gall—*Eriophyes* sp. Pyrus malus.

Capsule Galls on the upper side of the leaf. Apple and Pear "Leaf-blister" Gall—*Eriophyes pyri*—Plate K., fig. 6. Pyrus malus, P. coronaria and P. communis.

Knot-like swellings on the stems. Woolly Aphis Gall—*Schizoneura langigeria.* Pyrus malus.

Capsule Galls, very small. When mature, brown in color. Chokeberry Speck Gall—*Eriophyes* sp. Pyrus arbutefolia.

AFFECTING ROSE.

A.—*Galls on the leaves.*

Small, thin walled, spherical galls, red or green in colour, and covered with short spines. About .75 cm. in diameter and monothalamous. Spiny Ball Gall—*Rhodites nebulosus.*—Plate F., fig. 2. Rosa Carolina.

Small, circular galls about 3 mm. in diameter on the upper surface of the leaf. Pale green in colour and characterized by the presence of a little nipple in the centre of the gall. Nipple Gall—*Rhodites lenticularis* (Bass.) Rosa Carolina.

Round, woody, globular or irregularly shaped galls, covered with a white mealy substance. Mealy Rose Gall—*Rhodites ignotus* (O.S.)—Rosa sp.

B.—*Galls on the stem.*

Smooth, corky enlargement rising at each end abruptly from the branch; 2-2.5 cm. in length and 1-1.5 cm. in width. Globular Rose Gall—*Rhodites globulus.*—Plate F., fig. 4. Rosa Carolina.

Hard, small cells, clustered around a branch or twig. The cells are covered with a dense, thick mass of green filaments which grow from them; monothalamous and from 1.5-2 cm. in diameter. Mossy Rose Gall—*Rhodites rosae*—Plate E., fig. 4. Rose Carolina.

Large, round or oblong galls from 1 to 2 inches in length; reddish brown and covered with stout spines or prickles. Spiny Rose Gall—*Rhodites multispinosus* (Gill.)—Plate B., fig. 3. Rosa sp.

Spherical, covered with many prickly spines which vary in length, and are sometimes larger than the diameter of the gall. Internally it is hollow with the wall about 1 to 2mm. thick. Yellowish green, sometimes tinged with red. Soft and fleshy in summer; woody and brown in winter. It is found singly or in clusters of from two to ten or more, upon twigs of different kinds of wild roses. (Beutm.)—*Rhodites bicolor* (Harr.). Rosa sp.

Elongated swelling of the branch, gradually tapering at both ends. Smooth or densely covered with short spines. About 2 inches long and polythalamous. Long Rose Gall—*Rhodites dichlocerous* (Harr.). Rosa sp.

C.—*Galls on the roots.*

Large, irregularly rounded, reddish-brown galls from 1 to 2 inches in length; polythalamous. Rose Root Gall—*Rhodites radicum* (O.S.). Rosa sp.

AFFECTING SPIRÆA.

A pod-like gall formed by the folding of the leaf along the midvein. Spiræa Pod Gall—*Cecidomyia salicifolia*—Spiræa tomentosa, S. salicifolia and S. betulæfolia.

A bud-like, sessile gall in the axil of the leaf. Meadow Sweet Bud Gall—(Undescribed)—Spiræa salicifolia.

Small, cone-shaped galls on either the upper or lower surface of the leaf. Spiræa Cone Gall (Undescribed)—Spiræa salicifolia.

AFFECTING SUMAC.

The leaf margin rolled tightly upward and inward on both sides. Sumac Leaf-margin Gall—*Eriophyes* sp.—Plate K., fig. 3. Rhus typhina.

Irregular, rounded, dimple gall, convex on the upper or under side of the leaf. Green to red or purple in color; inside clothed with white trichomes. Poison Ivy Dimple Gall—*Eriophyes* sp.—Plate G., fig. 5. Rhus radicans.

Large, smooth, rounded galls, somewhat resembling a tomato in shape, on the under sides of the leaves. Sumac Potato Gall—*Pemphigus rhois*. Rhus typhina.

AFFECTING STRAWBERRY.

A much elongated, cylindrical enlargement of the petiole of the leaf, 1 to 4 in. long and 1-10 to 1-6 in. in diameter. Its surface, owing to slight annular constrictions has a more or less segmented appearance. The constrictions are seldom more than about .5 mm. deep and as a rule do not occur at regular intervals. Sometimes they are found every 1-16 of an inch, but in other cases they are as much as an inch apart. The surface of the gall is nearly red, or greenish, and is pubescent like the rest of the petiole. The texture is pulpy. The gall is polythalamous, as few as 10 and as many as 35 small chambers having been counted in specimens examined. These are all centrally situated and each contains a single, white larva, August 7, 1907. Occasionally two separate galls or gall clusters are found on a single petiole. Strawberry Petiole Gall. Plate R., fig. 7. Fragaria Virginiana.

AFFECTING TOUCH-ME-NOT.

Globular, succulent, semi-transparent, at base of flowers. Touch-me-not Flower Gall—*Cecidomyia impatiens* (O.S.). Impatiens fulva.

Green, succulent, globular or irregularly rounded swelling on the stem, petiole or leaf. Touch-me-not Stem and Leaf Gall—*Cecidomyia.* —Plate O., fig. 2. *fulva* (Bent)—Impatiens fulva.

AFFECTING TULIP TREE.

Hollow swellings, varying from 5 to 2.5 cm. in length on the midrib and lateral veins of the leaves. Tulip Tree Midrib Gall—*Cecidomyia tulipifera*—Liriodendron tulipifera.

AFFECTING VERVAIN.

An oval, hard and woody gall, an enlargement of the stem. Blue Vervain Stem Gall (Undescribed)— Verbena hastata.

AFFECTING VIBURNUM.

A small, blister-like gall, circular in outline, 3-4 mm. in diameter. Viburnum Leaf Blister Gall. Viburnum acerifolium.

AFFECTING VIRGINIA CREEPER.

Green and succulent fold gall on the midrib of the leaf. Midrib Gall on Virginia Creeper—*Cecidomyia* sp.—Plate E., fig. 7. Ampelopsis quinquefolia.

AFFECTING WHITE LETTUCE.

Large, rough, irregular swellings on stem. White Lettuce Stem Gall—*Aulax nabali* (Brodie)—Plate R., fig. 5. Prenanthes alba.

AFFECTING WILLOWS.

A.—*Galls on leaves.*

Smooth, fleshy, sessile, globular or slightly oval, monothalamous gall, like a miniature apple. About 1 cm. in diameter growing on one side of the midrib of the leaf. Willow Apple Gall—*Pontania pomum*—Salix sp.

Smooth, flattish, glossy enlargements of the petiole or often of the midrib of the leaf near the base. Willow Petiole Gall—*Pontania desmodeoides*. Salix lucida.

Irregularly elongate-oval fleshy galls projecting equally on both surfaces of the leaf. Usually many on a leaf. Willow Flat Gall—*Pontania hyalina*—Salix sp.

Cluster of massed leaves surrounding a small cell containing a yellowish larva. Similar in appearance to the Goldenrod Bunch Gall. Willow Bunch Gall—*Rhabdophaga brassicoides*—Salix sp.

A pale green or purple capsule gall, projecting either above or below the leaf, or both; 1½ to 2 mm. in diameter. *Eriophyes* sp. Salix cordata.

Small, irregular, serrate and roughened pocket-galls or semi-capsules, green or red, strongly pilose above and thickly pubescent beneath. Usually on the upper side of the leaf. *Eriophyes* sp.—Plate K., fig. 4. Salix discolor.

Small, crimson pocket-galls or semicapsules on the upper side of the leaf. 1½ to 2½ mm. in diameter. *Eriophyes* sp. Salix amygdaloides.

A small capsule gall, irregularly hemispherical, greenish yellow, with a projecting aperture usually on the lower surface of the leaf, 1 to 2½ mm. in diameter. *Eriophyes* sp. Salix nigra.

Small irregular, serrate capsule-gall, green or red, usually on the upper side of the leaf; beneath sometimes impressed, more often projecting. 1 to 2 mm. in diameter. *Eriophyes* sp. Salix bebbiana.

Small irregular, serrate capsule-gall, projecting on both sides of the leaf, 1 to 2 mm. in diameter. *Eriophyes* sp. Salix petiolaris.

A bud deformation of the flower catkins and leaf buds or parts of leaves, producing a large, irregular, crumpled mass. *Eriophyes* sp.—Plate D., fig. 5. Salix nigra.

Rosette-like structures on the leaves and stems. Unsightly Willow Gall—*Eriophyes* sp. Salix sp.

This gall has two different forms in the course of its development. There is first the "bead" stage, when each gall looks like a small yellowish-white bead about 1.5 mm. in diameter, two-thirds of the bead appearing on the under and nearly one-third on the upper surface of the leaf. The tip of the bead, on the lower side of the leaf, is perforated. The texture is hard and close and the surface even and somewhat pubescent. The second stage seems to occur in July. In this month the galls elongate on the lower surface into nipples 3-4 mm. long and 1-1.5 mm. in diameter. The color is rather lighter than before, except that the end of the nipple itself is often nearly black. The pubescence is much more visible than before. The galls occur either singly or in closely united groups of 2-15, chiefly along or near the midrib. They are monothalamous but no larvae were discovered in the specimens examined. Willow-leaf Bead and Nipple Gall—(Undescribed)—Salix rostrata.

B.—*Galls on stems.*

Large, rough galls on the stems of the Willow. The galls are smooth at first but become rough later in the season. Willow Branch Gall—*Saperda concolor*—Salix sp.

Cone-shaped mass of closely-imbricated leaves at the end of a twig, caused by the arrest of growth at the end of the stem. Pine Cone Willow Gall—*Cecidomyia strobiloides.*—Plate O., fig. 7. Salix sp.

Club-shaped gall formed on the lateral shoots of the Willow, an enlargement of the whole stem. About ¾ of an inch in length. Willow Club Gall—*Cecidomyia rigida*—Salix sp.

Oval galls on the sides of the twigs, hard and woody and usually the same colour as the stem.

Willow Egg Gall, *Euura ovum*—Salix sp.

Oblong-ovate, polythalamous galls, about the same color as the bark while young but gray when mature. Willow Potato Gall—*Rhabdophaga batatas* O.S.—Plate A., fig. 7. Salix sp.

Irregularly woody, oval enlargement of the stem at the joints or nodes. 1-3 to ½ an inch in length. Willow Joint Gall—*Rhabdophaga nodulus* (Walsh). Salix sp.

C.—*Galls of the Buds.*

Altered or transformed buds. The bud scales become elongated and the interior becomes a cavity in which the larva lives. Willow Bud Gall—*Rhabdophaga trilicoides* (Walsh). Salix sp.

AFFECTING WILD LETTUCE.

An irregular, oval, polythalamous, knotty enlargement of the stem varying greatly in size. The interior is soft and pithy. Lettuce Tumor Gall—*Aulax tumidus*—Lactuca Canadensis.

AFFECTING WITCH HAZEL.

A conical swelling on upper side of leaf. Witch Hazel Cone Gall—*Hormaphis hamameliais* (Fitch).—Plate I., fig. 2. Hamamelis virginiana.

Round gall covered with long spines. A deformation of the fruit bud. Spiny Witch-Hazel Gall—*Hormaphis spinosus*—Plate I., fig. 1. Hamamelis virginiana.

AFFECTING WOOD NETTLE.

Ball-like galls occurring either on the upper or lower surface of the leaf. Wood Nettle Ball Gall—*Cecidomyia urnicola*—Plate F., fig. 3. Laportea Canadensis.

A gall consisting of a malformation of the fruit, much like the ball gall on the leaves. Wood Nettle Fruit Gall—*Cecidomyia* sp.—Laportea Canadensis.

Soft, smooth, spongy, oval or rounded gall of a pale brown colour, on the stem. About 1 cm. in diameter. Wood Nettle Pod Gall—(Undescribed). Laportea Canadensis.

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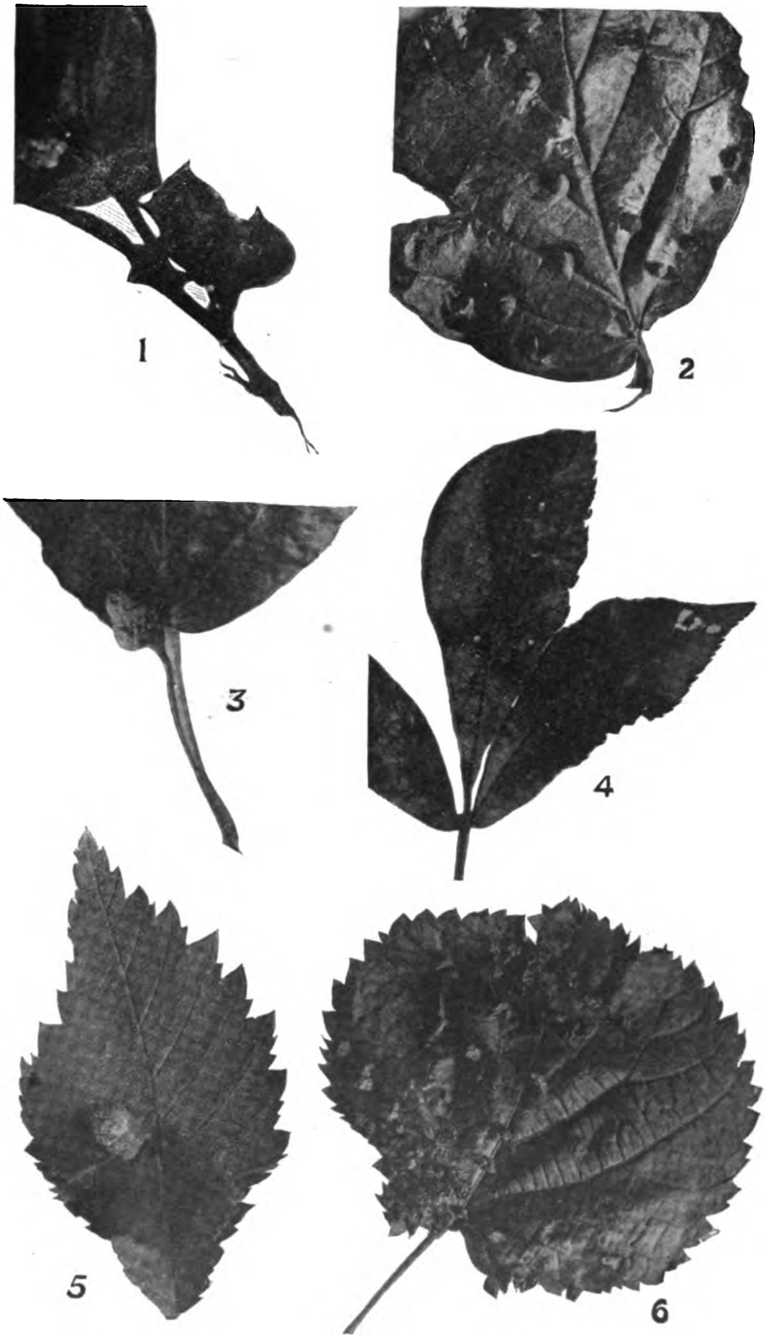
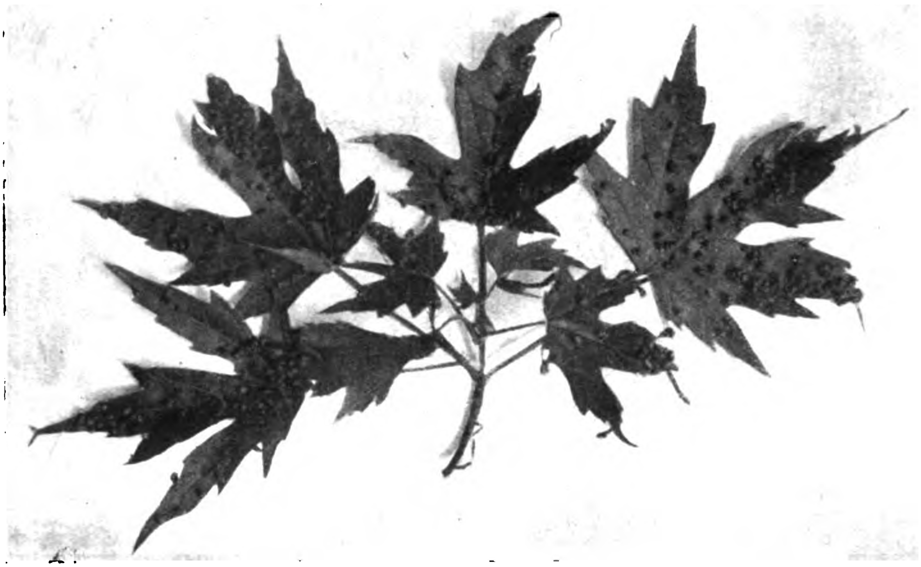


Plate I.

1. Spiny Witch-Hazel Gall. (*Hormaphis spinosus.*)
2. Witch-Hazel Cone Gall. (*Hormaphis hamamelidis.*)
3. Cottonwood Petiole Gall. (*Pemphigus populicaulis.*)
4. Hickory Cone Gall. (*Phylloxera caryae-fallax.*)
5. Cockscomb Gall on Elm. (*Colopha ulmicola.*)
6. Basswood Mite Gall. (*Eriophyes abnormis.*)

B



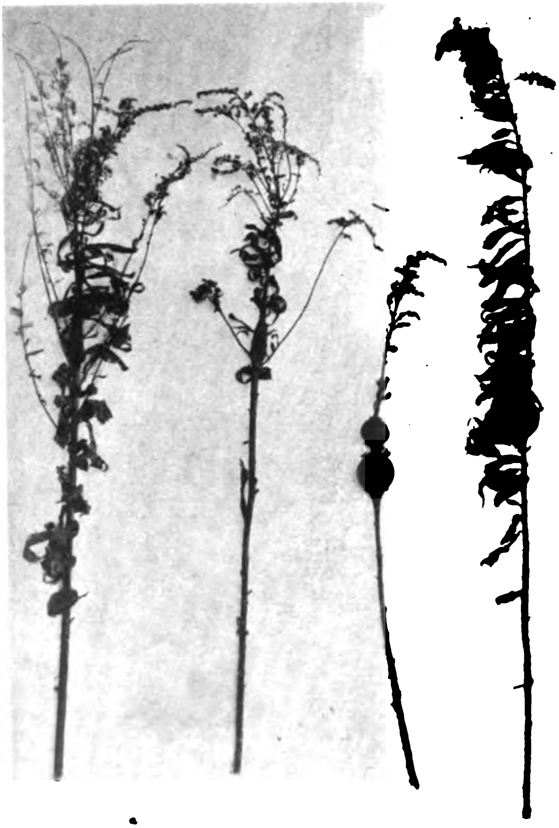


Plate J.

1. Soft Maple Mite Gall. (*Phloecoptes quadripes*).
2. Two specimens on left. (*Eucosma scudderiana.*)
3. Two specimens on right. (*Trypeta solidaginis.*)

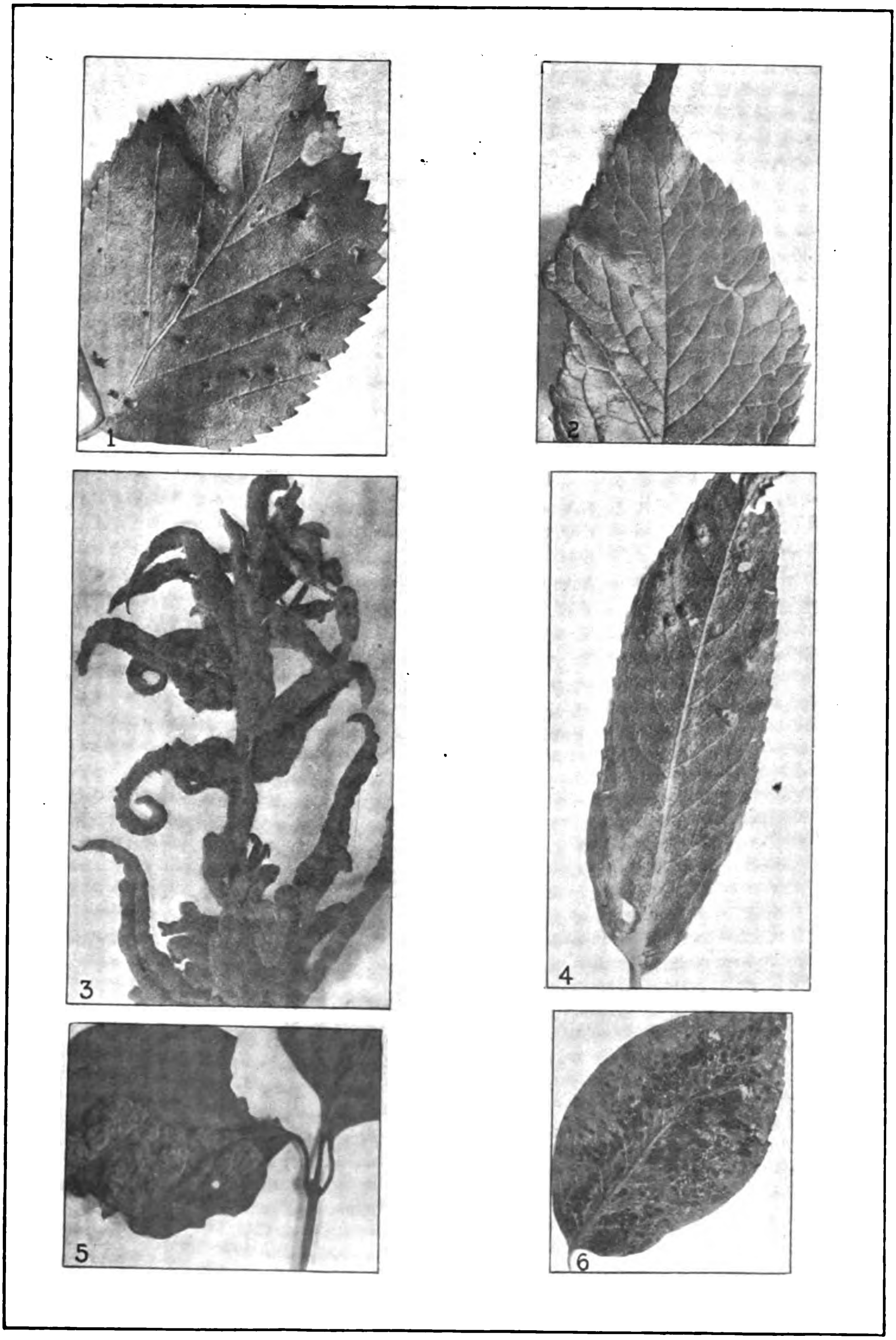


Plate K.

1. Eriophyes sp., Betula papyrifera.
2. Eriophyes sp., Prunus Americana.
3. Eriophyes sp., Rhus Cotinus.
4. Eriophyes sp., Salix discolor.
5. Eriophyes cephalanthae, Cephalanthus occidentalis.
6. Eriophyes pyri sp., Pyruis communis.

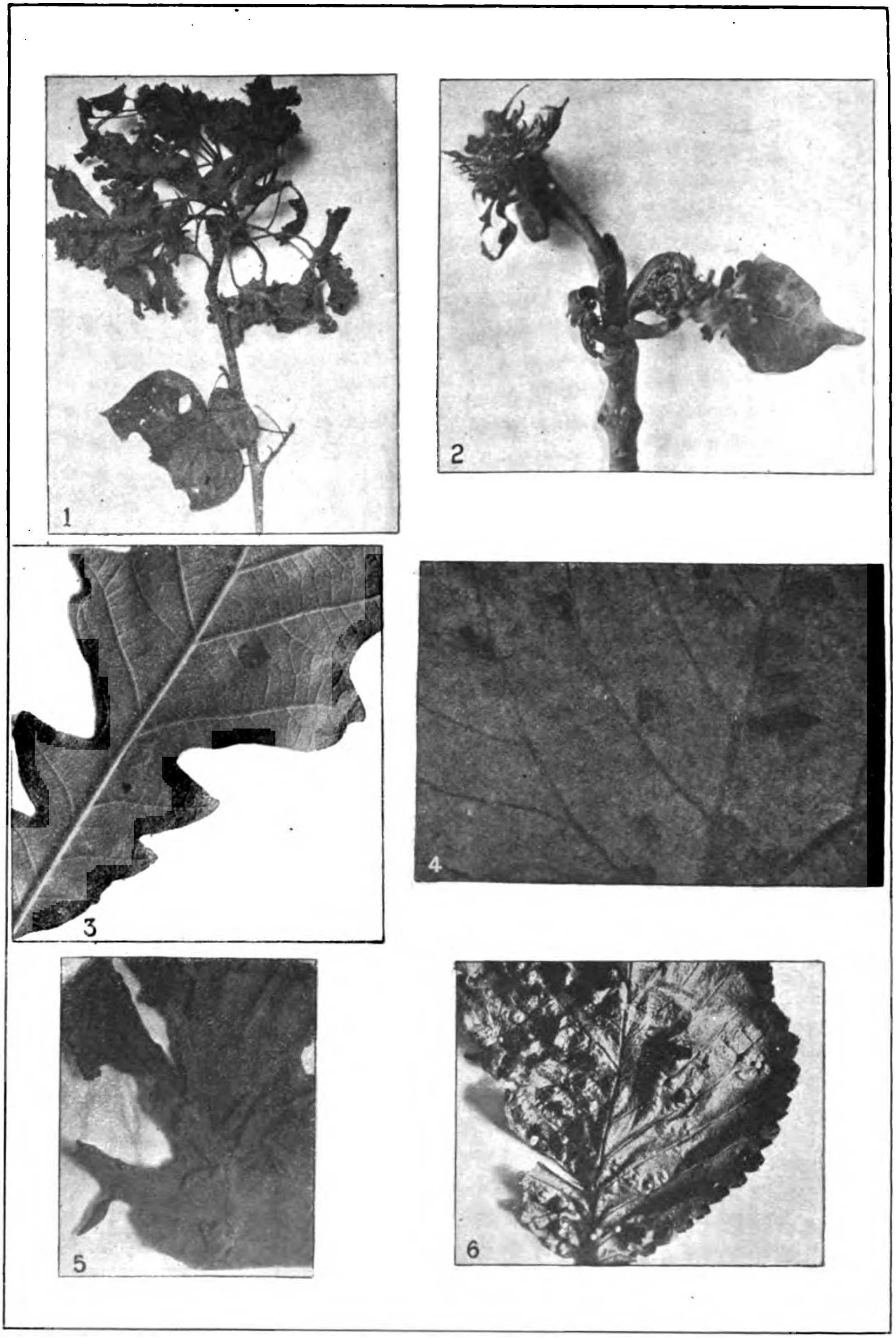


Plate L.

1. Eriophyes sp., Populus tremuloides.
2. Eriophyes sp., Fraxinus Americana.
3. Eriophyes sp., Quercus macrocarpa.
4. Eriophyes sp., Vitis sp.
5. Eriophyes sp., Ulmus Americana.
6. Eriophyes sp., Ulmus pubescens.

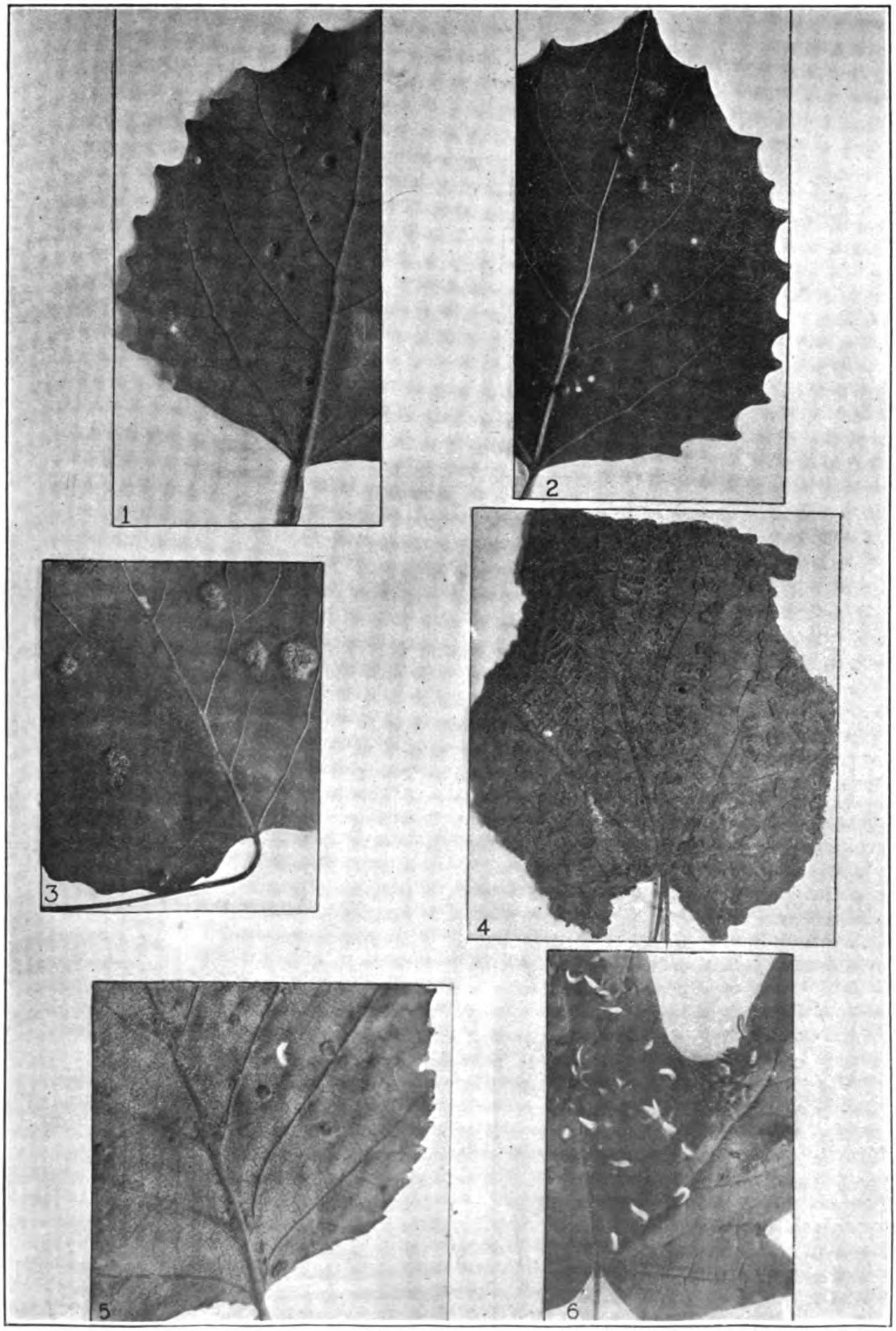
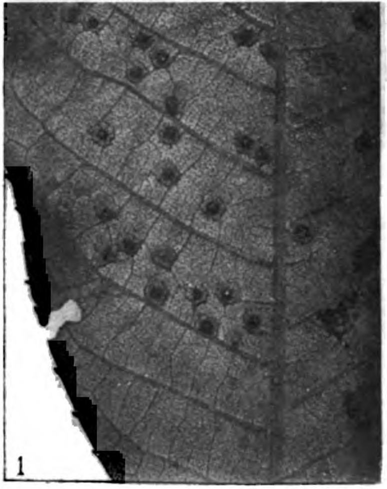
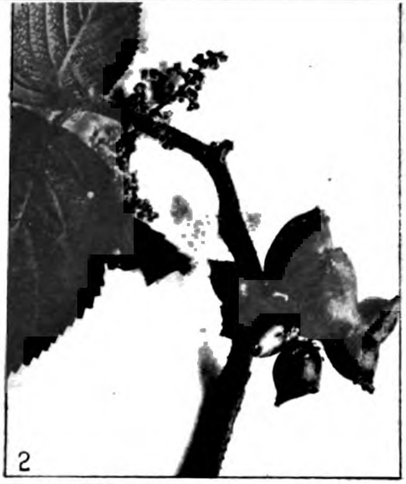
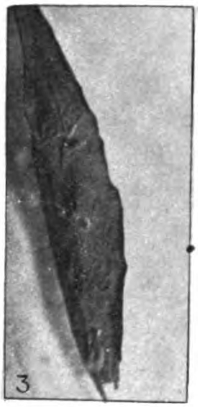


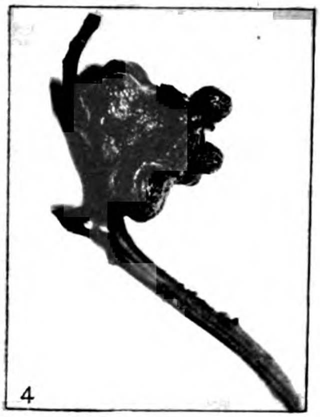
Plate M.

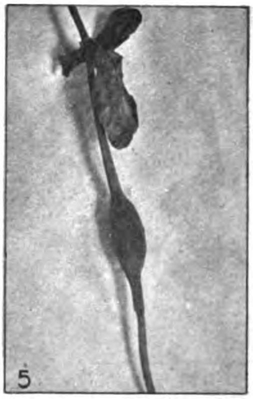
1. Eriophyes sp., (under surface) Populus grandidentata.
2. Eriophyes sp., (upper surface) Populus grandidentera.
3. Eriophyes sp., Populus tremuloides.
4. Eriophyes sp., Tilia Europea.
5. Eriophyes sp., Betula papyrifera.
6. Phlœocoptes aceris, Acer saccharum.

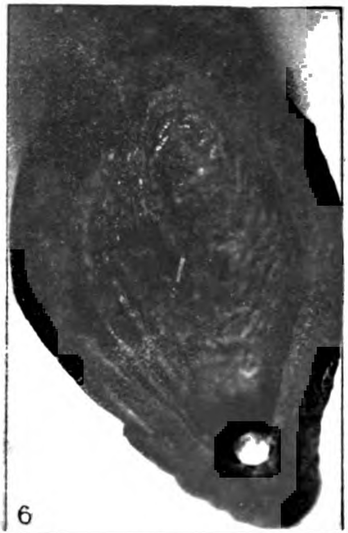












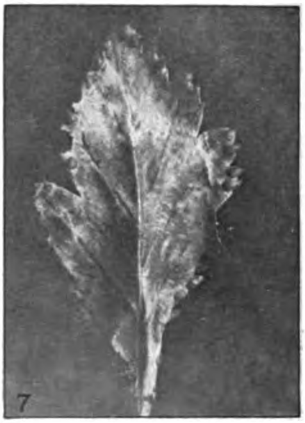


PLATE N.

1. Hickory Gall.
2. Pod or fruit gall, Laportea Canadensis.
3. Golden Rod seed gall, Solidago Canadensis.
4. Cecidomyia caryae-nucicola, Carya alba.
5. Lasioptera lycopi, Lycopus virginicus.
6. Cecidomyia virginiana, interior of gall, Prunus virginiana.
7 Hawthorn Leaf-border gall, Crataegus sp.

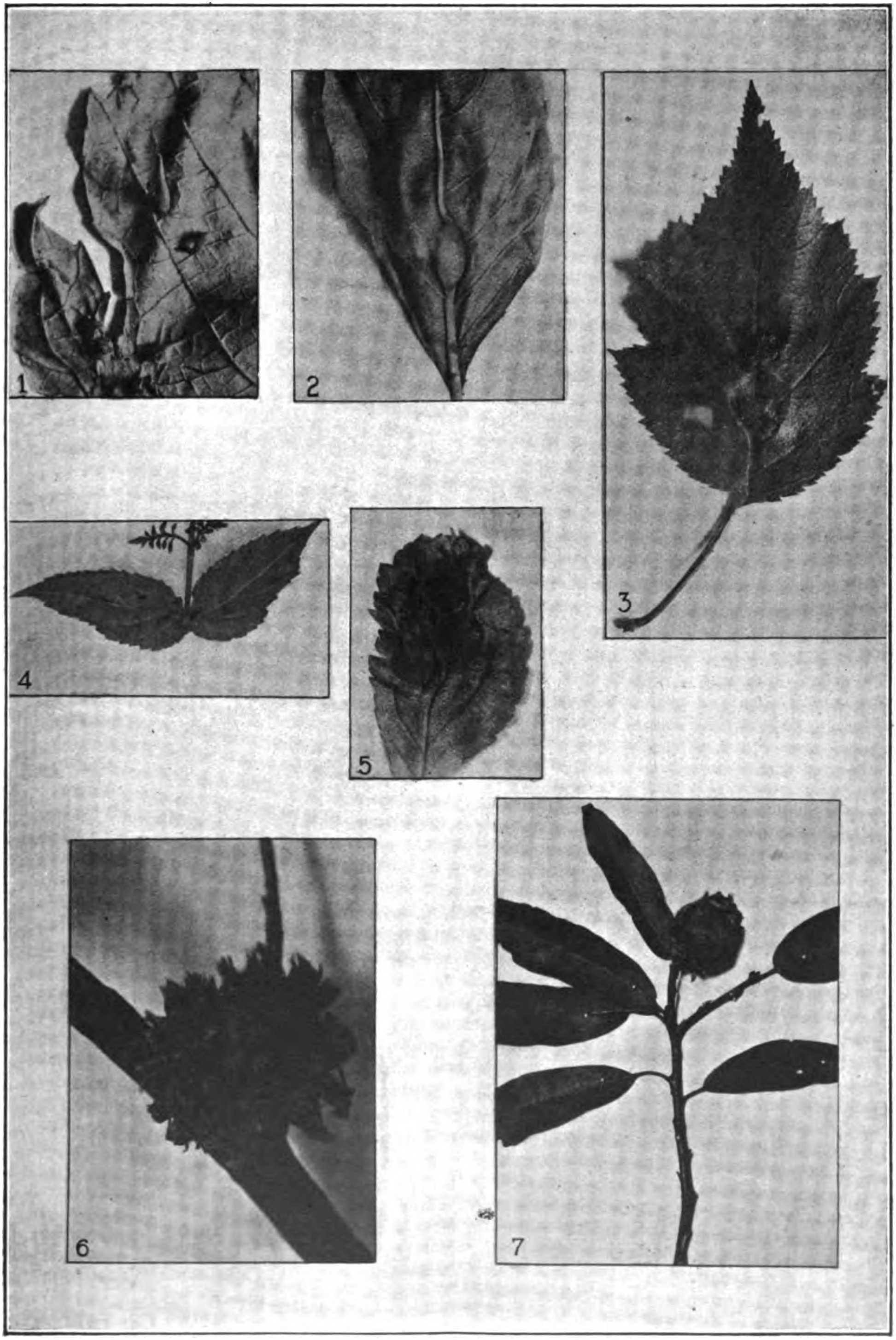
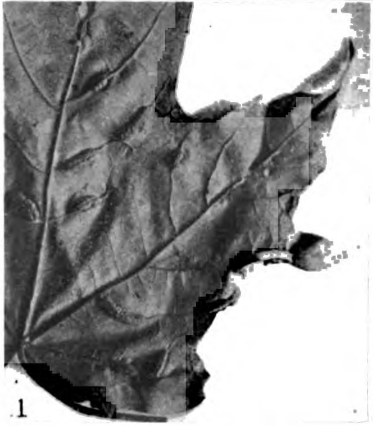


PLATE O.

1. Cecidomyia viticola, vitis sp.
2. Cecidomyia sp., Impatiens fulva.
3. Cecidomyia bedeguar, Ceataegus.
4. Cecidomyia? collinsoniae, Collinsonia Canadensis.
5. Hawthorn Bladder gall, Crataegus, sp.
6. Gooseberry Bud gall, Ribes grossulare.
7. Cecidomyia Strobiloides, Salix discolor.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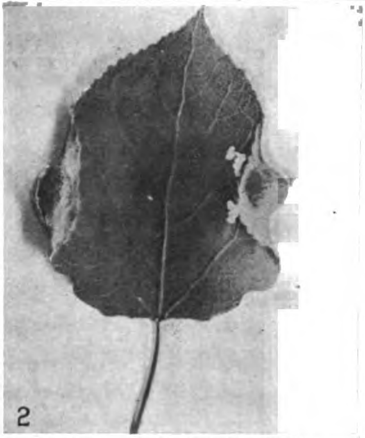
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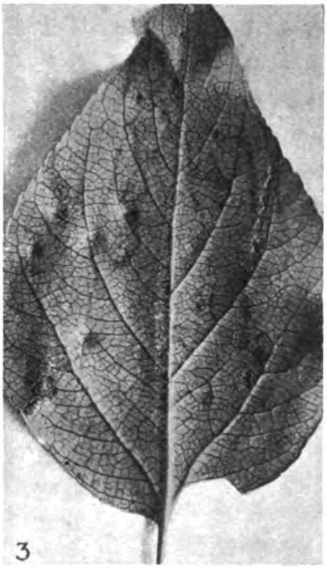
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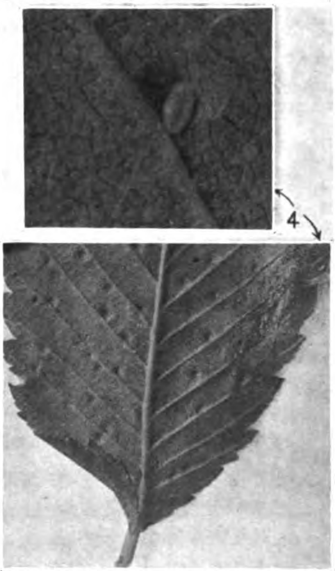
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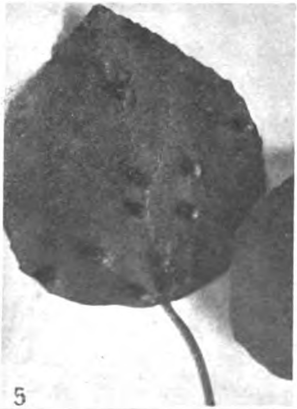
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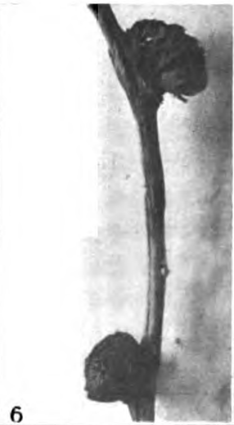
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PLATE P.

1. Maple Vein gall, Acer Saccharum.
2. Aspen Tent gall, Populus tremuloides.
3. Balm of Gilead pimple gall, Populus balsamifera.
4. Elm-Pimple gall, Ulmus Americana.
5. Aspen Ball gall, Populus tremuloides.
6. Red Elm Bud gall, Ulmus fulva.

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ENTOMOLOGICAL RECORD 1908.

BY JAMES FLETCHER AND ARTHUR GIBSON.

The season of 1908 in most parts of Canada was an exceptionally dry one. The continued drought which began in early June, lasted well on into September in many parts of the Dominion. The weather, too, was extremely hot, and vegetation, consequently, was much injured and reduced in vigour. Insects have been particularly numerous in certain localities, and some kinds of injurious species were very destructive. From the collector's standpoint, the season, on the whole, throughout the country, was probably better than that of each of the three or four preceding years. Some correspondents report that the season in their immediate vicinity has been a particularly poor one, others that it has been an improvement on the recent years. More are of the latter opinion.

As in the past a great many records have been sent in by correspondents. From these have been taken those which, for one reason or another, have been thought to be of most interest. As has been pointed out before, an insect may seem rare to the collector who sends in the record, when in reality, its occurrence may be widerspread, and for this reason not worth recording in the Record.

As in previous years, some of the federal Government officers brought back with them, from their distant fields of labour, small collections of insects of special interest. Mr. Joseph Keele, during the past summer, made some valuable collections at the mouth of the Gravel River and along the McKenzie River adjacent, on the eastern slope of the Rockies. Mr. C. H. Young, of the same Department, spent the months of August and September at the Biological Station, Departure Bay, B.C., with the well-known lepidopterist, Rev. G. W. Taylor, who is now there as Curator of the Station. Mr. Young collected insects of several orders, among which are many of much interest. Mr. Douglas H. Nelles, of the Alaska Boundary Survey, spent the summer in the Yukon District, between White Horse and the 141st Meridian, and made a collection of butterflies. Mr. Andrew Halkett of the Fisheries Museum, returned to Ottawa in November, bringing with him a small collection of various insects taken in Alberta. Dr. Fletcher made a hurried trip to British Columbia in September and October, and while stopping over for a day or two, each at Nepigon, Ont.; Regina, Sask.; Banff and Laggan, Alta.; and Departure Bay, B.C., collected many insects of value. Mr. Gibson spent most of July at Youghall, N.B., and while there made collections in all orders.

Acknowledgments are again due to the leading specialists in the United States who have rendered much help to Canadian students during the year: Dr. L. O. Howard, with his assistants at Washington; Dr. J. B. Smith, of New Brunswick, N.J.; Professor H. F. Wickham, of Iowa City, Iowa; Mr. W. D. Kearfott, of Montclair, N.J.; Mr. E. P. Van Duzee, of Buffalo, N.Y.; Mr. Wm. Beutenmuller and Professor R. C. Osburn, of New York, N.Y., and Prof. J. S. Hine, of Columbus, Ohio. Sir George Hampson, of the British Museum, has also been of much help in identifying specimens of lepidoptera.

N.B.—Owing to the death of my good friend, chief, and ever kind teacher, Dr. James Fletcher, the manuscript of the Entomological Record for 1908 has had to be prepared by me. Dr. Fletcher had, I know, certain records and other notes which he intended to include. I trust, however, that any omissions which may be noticed will be made known, so that they can be included in the Entomological Record for 1909.—*Arthur Gibson.*

LITERATURE.

Among the many valuable publications which have been received during the past year, and which are of interest to Canadian students, mention may be made of the following:—

BANKS, NATHAN. Catalogue of the Neuropteroid Insects (except Odonata) of the United States. Philadelphia: Transactions, American Entomological Society, 1907. This valuable catalogue of neuropteroid insects was not received in time to be mentioned in last year's Record. The name of the author is sufficient to guarantee the usefulness of this list. Altogether there are nearly 900 species included in the catalogue, arranged under 210 genera.

BETHUNE, C. J. S. Bibliography of Canadian Entomology for the year 1907. Ottawa: Transactions of the Royal Society of Canada, Third Series—1908-1909, Volume II., Section IV.; separate received December 15, 1908. This paper, which is annually presented to the Royal Society of Canada by the Rev. Prof. Bethune, is a most useful publication. In the above bibliography, 125 references are made to contributions which have appeared during 1907, all of which are of value to Canadian students. With each reference a short explanatory statement is made. We are very grateful to the author for this annual publication. To many, it is the only source of reference to articles which have appeared during the year on Canadian Entomology.

BUSCK, AUGUST. A Generic Revision of American Moths of the Family Œcophoridæ, with Descriptions of New Species. Proc. U.S. Nat. Museum, Vol. XXXV., pp. 187-207; published Oct. 31, 1908. The results of Mr. Busck's work on Microlepidoptera are always of much value. In this paper the genera of the above family are treated of. As very little study had previously been given to the North American species, this contribution will be of great service to students of Tineid moths. Mr. Busck states that there are now 121 described species of this family represented in North America.

BRADLEY, J. CHESTER. The Evaniidæ, Ensign-flies, an Archiac Family of Hymenoptera. Trans. Amer. Ent. Soc., Vol. XXXIV., No. 2, April-May-June, 1908; pp. 101-194, 11 plates. This contribution deals with the North American species of Evaniidæ, insects which are usually not well represented in collections. References to species occurring in Canada are given and many new forms described. This paper will prove of much use to hymenopterists. The Ensign-flies, which are so named because they carry the abdomen aloft like a flag, are parasitic.

CAUDELL, ANDREW NELSON. Notes on some Western Orthoptera, with the Description of one New Species. Proc. U.S. Nat. Museum, Vol. XXXIV, pages 71-81; published April 17, 1908. As this paper includes notes on species collected in western Canada in 1906, it will prove of value to those of our entomologists who study orthoptera. 27 different species are recorded, from British Columbia, Alberta and Saskatchewan.

FERNALD, C. H. The Genera of the Tortricidæ and their Types. Amherst, Mass.; published by the author, June, 1908. Professor Fernald is to be congratulated on this most valuable piece of work. Over 300 generic names are reviewed. In the *Canadian Entomologist,* Sept. 1908, Mr. Kearfott says: "This work is the first of its kind that has ever been published in the Microlepidoptera. As its title implies, it takes up one by one every Tortricid genus known to the author, from the tenth edition of Linnæus down to the present day, and fixes and names the type species in each genus."

HARRINGTON, W. HAGUE. Fauna Ottawensis: Hymenoptera—Superfamily III.—Vespoidea; The Ottawa Naturalist, July, 1908. This contribution to the insects of the Ottawa District is a most welcome one. Mr. Harrington has always paid special attention to the fauna of this locality, and, as our highest Canadian authority on the hymenoptera, the above paper, which mentions 87 different species, is of much value. In the introductory remarks information is given on the Families Ceropalidæ, Vespidæ, Eumenidæ, Chrysididæ, Bethylidæ, Tiphiidæ, Thynnidæ, Myromosidæ and Mutillidæ.

KEARFOTT, W. D. Descriptions of New Species of North American Crambid Moths. Proc. U.S. Nat. Museum, Vol. XXXV., pp. 367-393; separates published Oct. 31, 1908. In this valuable contribution to the Pyralidæ, 20 new North American species of crambid moths are described, 5 of which are from Canada.

KNAB, FREDERICK. Observations on the Mosquitoes of Saskatchewan. Reprinted from Smithsonian Miscellaneous Collections (Quarterly Issue), Vol. 50; published Feb. 20, 1908. These observations were the result of an expedition to western Canada during the spring of 1907. Nine different species were collected, eight of the genus *Aedes* and one of the genus *Culiseta*. The habits of some of the species are discussed, and notes given on their life-histories.

MITCHELL, EVELYN GROESBEECK. Mosquito Life. J. P. Putnam's Sons, New York and London. The Knickerbocker Press, (1907). This most interesting and extremely valuable book came to hand early in 1908. It reviews previous work on these important insects, and includes much original matter not previously published. The titles of the different chapters will give an idea of the extent of the work. I. Systematic Position and Structure. II. Some Habits of the Adults. III. How Far Mosquitoes Fly. IV. Mating. V. Larvæ and Pupæ. VI. Malaria. VII. Yellow Fever and Other Diseases. VIII. Mosquito Remedies and Enemies. IX. Notes on the Commoner Species. X. Collecting and Laboratory Methods. XI. Identification Keys and Systematic List.

OSBURN, RAYMOND C. British Columbia Syrphidæ, New Species and Additions to the List. Canadian Entomologist, January, 1908. In this paper, 50 different species are mentioned, 6 of which are described as new. This article brings the list of British Columbian Syrphidæ up to 128 different species. It is pleasing to note that the large majority of the species were collected by local entomologists. This and Mr. Osburn's previous paper, (Can. Ent., Vol. XXXVI., Aug.-Sept., 1904), will make an excellent foundation for future work, in this family, for British Columbian dipterists.

SMITH, JOHN B. Notes on the Species of Amathes, Hbn., Philadelphia: Transactions, American Entomological Society, XXXIII., Nov. 1907; separate received Feb. 3, 1908. This paper, which treats of some of the North American species of noctuids in our lists under the genus *Orthosia*, is a welcome addition to the literature. Ten species of the genus *Amathes* have been found in Canada. This genus has the "Proboscis fully developed; palpi obliquely porrect, fringed with long hair in front, the 3rd joint short; frons smooth; eyes large, rounded; antennæ of male typically ciliated; head and thorax clothed with hair only; the tegulæ produced to a dorsal ridge, the pro- and metathorax without distinct crests; abdomen dorsally flattened, with lateral tufts of hair and some rough hair at base but without crests. Forewings with the termen evenly curved."

SMITH, JOHN B. A Revision of Some Species of Noctuidæ heretofore referred to the Genus Homoptera, Boisduval. Proc. U. S. Nat. Museum, Vol. XXXV., pp. 209-275, separates published November 10, 1908. This important contribution on the old genus Homoptera will be hailed with delight by lepidopterists. There has been so much confusion in the genus, and it was previously very difficult, in many instances, to get exact determinations. Dr. Smith has gone into the subject very fully. Of the 25 species treated of, nine are recorded from Canada. In addition four other species occur in Canada, as mentioned in the *Ottawa Naturalist*, October, 1908. The old name Homoptera is replaced by Phœocyma of Hubner, an earlier name.

VAN DUZEE, E. P. Studies in North American Membracidæ. Bulletin of the Buffalo Society of Natural Sciences, Vol. IX., pp. 29-129; issued April 18, 1908. This publication will prove of much value to hemipterists. Most of the Membracidæ, or "tree-hoppers," are of uncommon occurrence, and for that reason, probably, the family has not been very much studied. The author gives tables of the sub-families, genera and species, and, at the end, a list of all species known to occur north of the southern boundary of the United States.

The following is a list of the names and addresses of collectors heard from during 1908:—

Anderson, E. M., Provincial Museum, Victoria, B.C.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., c/o King Brothers, Quebec, Que.
Brodie, Dr. W., Provincial Museum, Toronto.
Bush, A. H., 1105 Ninth Ave., Vancouver, B.C.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kalso, B.C.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Denny, Edward, 200 Mitcheson Street, Montreal.
Dent, W. A., Sarnia, Ont.
DeWolfe, L. A., Penticton, B.C.
Dod, F. H. Wolley- Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fletcher, James, Experimental Farm, Ottawa.
Fyles, Rev. T. W., Levis, Que.
Gibson, Arthur, Experimental Farm, Ottawa.
Groh, H., Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harms, J. F., Treesbank. Man.
Harrington, W. H., P.O. Department, Ottawa.
Harvey, R. V., Victoria, B.C.
Heath, E. F., Cartwright, Man.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph.
Keele, Jos., Geological Survey, Ottawa.
Keen, Rev. J. H., Metlakatla, B.C.
Létourneau, Jos. A., Exp. Farm, Ottawa.
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancouver, B.C.
McIntosh, W., St. John, N.B.

Metcalfe, W., 288 Bank Street, Ottawa.
Moore, W. H., Scotch Lake, N.B.
Moore, G. A., 209 Prince Arthur Street, Montreal.
Morris, Frank, Port Hope, Ont.
Nelles, Douglas H., Dept. Interior, Ottawa.
Perrin, Jos., McNab's Island, Halifax, N.S.
Ross, Ernest, Port Arthur, Ont.
Russell, John, Digby, N.S.
Sanson, N. B., Banff, Alta.
Saunders, Henry, 21 Harbord Street, Toronto.
Sherman, R. S., 2285 Sixth Ave., Vancouver, B.C.
Simpson, W., Dom'n Observatory, Ottawa.
Swaine, J. M., Macdonald College, Que.
Taylor, Rev. G. W., Departure Bay, B.C.
Tipping. E. Dalton, Bluff Centre, Alta.
Venables, E. P., Vernon, B.C.
Walker, Dr. E. M., 99 St. George St., Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Willing, T. N., Regina, Sask.
Wilmot, E. S., Vernon, B.C.
Wilson, W. J., Geological Survey, Ottawa.
Winn, A. F., 132 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O. A. C., Guelph, Ont.

NOTES OF CAPTURES.

LEPIDOPTERA.

(Arranged according to Dyar's List of North American Lepidoptera, U.S.N.M. Bull. No. 52).

RHOPALOCERA.

(Dyar's number).

20. *Papilio indra* Reakirt, a. *nitra* Edw. Bluff Centre, Alta., (Tipping).
23. *Lærtias philenor* L. Grimsby, Ont., larva, Aug. 9, (J. W. Daniel).
92. *Euptoieta claudia* Cram. Toronto, "Humber Road, Old Mill," July, (Hahn).
104. *Argynnis electa* Edw. Hope Mts., B.C., not common, July 17, (Sherman).
134. *Brenthis triclaris* Hbn. Mer Bleue, near Ottawa, June 6, three specimens, (Young, Criddle, Gibson).
158. *Lemonias taylori* Edw. Hope Mts., several taken at summit, 5,800 feet, July 20, (Sherman, Harvey, Day).
189. *Phyciodes tharos* Dru. Hope Mts., July 21-23, (Sherman, Harvey, Day). A fine specimen of the aberration *packardii* Saund., was taken at the Mer Bleue, near Ottawa, by Mr. Young.
190. *Phyciodes batesii* Reakirt. On railway track, between Cache Bay and Beaver Meadow, Hull, Que., June 13. (Gibson).
223. *Junonia coenia* Hbn. Orillia, four specimens in two days. It looks as if this butterfly had become a permanent resident, (Grant). Toronto, August, (Miss F. Hahn).

271. *Erebia vidleri* Elwes. Hope Mts., July 20, (Day).
376. *Incisalia henrici* G. & R. A specimen of this butterfly taken at Montreal by the late Mr. Caulfield has recently been identified by Mr. Cook, who says it is the furthest northern record.
584. *Epargyreus tityrus* Fab. Cartwright, Man., one in garden, June 19, second appearance here, (Heath).

HETEROCERA.

678. *Pholus pandorus* Hbn. Ottawa, larva on Virginian Creeper, moth emerged July 8, (Gibson).
747. *Tropœa luna* L. Winnipeg, Man., June 1, (Wallis). Mr. Wallis also reports that a specimen of this rare moth was taken some years ago at Gall Harbour, (Miss Cowley).
836. *Utetheisa bella* L. Hyde Park, Ont., one specimen, end August, (J. F. Weir); Hymers, Ont., Sept. 19, (Dawson).
853. *Estigmene prima* Slosson. Winnipeg, June 2, two specimens, (Wallis).
861. *Phragmatobia assimilans* Wlk., a. *franconia* Slosson, Hymers, June 9, (Dawson).
868. *Neoarctia beanii* Neum. Larva from N. B. Sanson, found on Sulphur Mountain. Moth emerged at Ottawa, June 15, (Gibson).
872. *Hyphoraia parthenos* Harr. Ottawa, a fine specimen, at light, July 1, (Baldwin). Rare at Ottawa.
874. *Apantesis virgo* L., a. *citrinaria*, N. & D., Toronto, (Hahn).
888. *Apantesis nevadensis* G. & R., b. *superba* Stretch. Hope Mts., July 20, (Sherman). Penticton, B.C., (Wallis).
889. *Apantesis williamsii* Dodge, a. *determinata*, Neum., July 7, (Dawson), first Ontario record.
890. *Apantesis phyllira* Dru. Toronto, (Hahn).
1,000. *Apatela quadrata* Grt. Hymers, June 22, (Dawson); Orillia, (Grant).
Apatela inclara Sm. Billings Bridge, Ottawa, (Fletcher). New record for district.
1,034. *Apatela perdita* Grt. Peachland, B.C., July 8, (Wallis).
1,047. *Apharetra pyralis* Sm. Aweme, Aug. 28, (E. Criddle).
1,075. *Baileya doubledayi* Gn. Ottawa, July 20, (Baldwin).
1,084. *Catabena lineolata* Wlk. Ottawa, July 20, (Baldwin). First record for the district.
1,088. *Platysenta videns* Gn. Cartwright, Man., one, July 4, always rare, (Health); Ottawa, June 6, (Gibson).
1,165. *Hadena diversicolor* Morr. Sudbury, (Evans).
1,176. *Hadena didonea* Sm. Trenton, (Evans).
1,216. *Hadena contradicta* Sm. Hymers, June 22, (Dawson). First record received for Ontario.
1,229. *Hadena alticola* Sm. Metlakatla, B.C., (Keen).
Hadena multicolor Dyar. Victoria, B.C., May 22, (Harvey).
1,255. *Macronoctua onusta* Grt. Trenton, four specimens, Sept. 17, 18, 20, 25, (Evans). Larva again found at Ottawa, (Gibson).
1,341. *Oncocnemis atrifasciata* Morr. Hymers, Aug. 22, (Dawson).
Rhynchagrotis sambo Sm. Ainsworth, B.C., Aug. 3, 11, (Rev. G. H. Findlay); Kaslo, July and August, (Cockle); Peachland, July, (Wallis).
1,412. *Adelphagrotis stellaris* Grt. Victoria, July 26, (Anderson); Duncans, (Hanham).

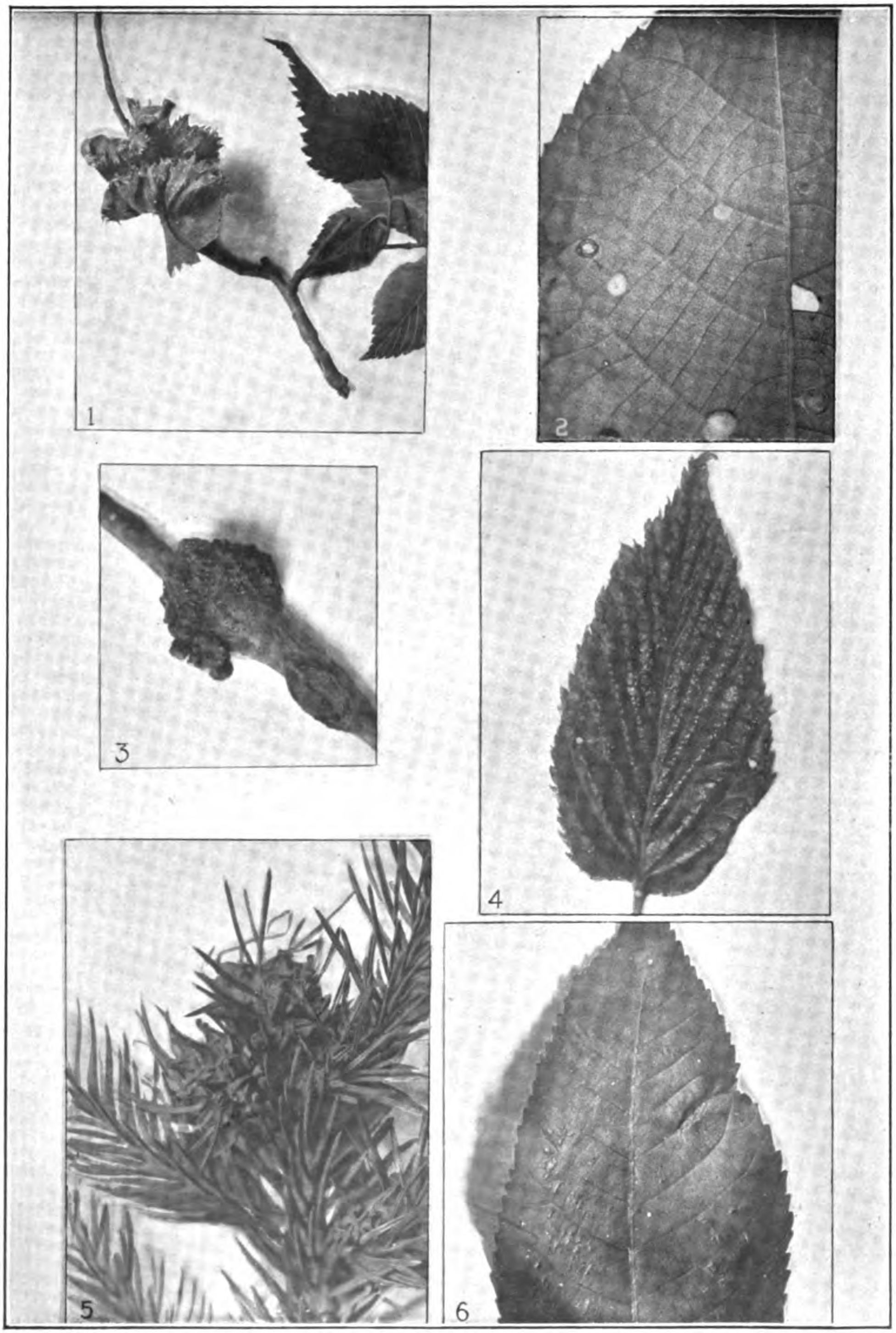

Plate Q.

1. Schizoneura Americana, Ulmus Americana.
2. Phylloxera sp., Carya alba.
3. Schizoneura sp., Populus tremuloides.
4. Schizoneura sp., Alnus incana.
5. Chermes abietis, Picea excelsa.
6. Phylloxera caryaevena, Carya ovata.

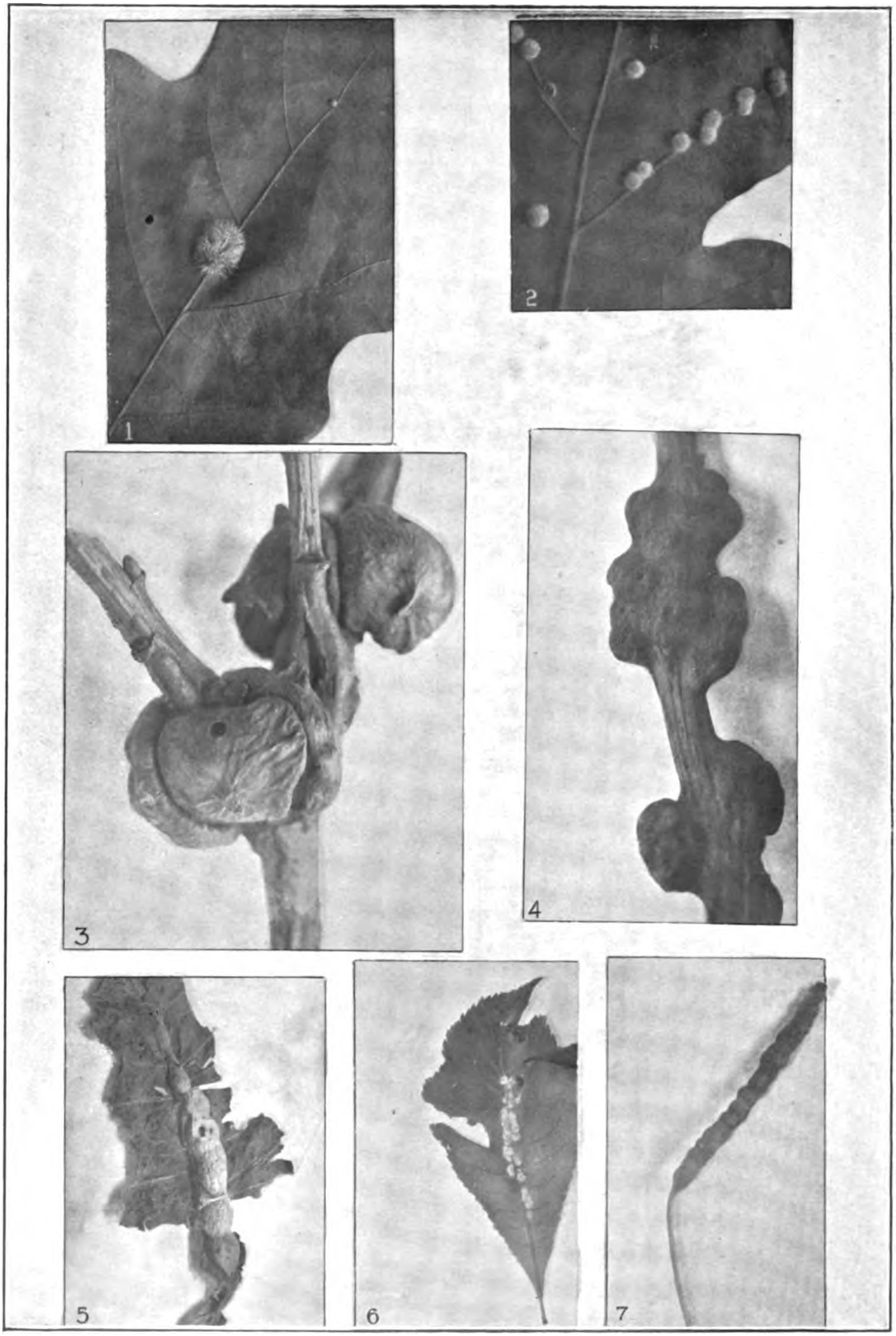

PLATE R.

1. Acraspis erinacei, Quercus alba.
2. Neuroterus floccosus, Quercus alba.
3. Andricus ventricosus, Quercus sp.
4. Aulax nabali, Prenanthes alba.
5. Gilletia taraxaci, Taraxacum officinale.
6. Cecidomyia holotricha, Carya ovata.
7. Strawberry Peticle gall Fragaria virginiana.

THE LATE JAMES FLETCHER, LL.D., F.R.S.C., F.L.S.

1,430. *Pachnobia monochromatea* Morr. Ottawa, July 3, (Young).

1,431. *Pachnobia littoralis* Pack. Hymers, June 22, (Dawson). Only Ontario record we have.

1,434. *Pachnobia wockei* Moeschl. Labrador, July 19, (Dr. A. P. Low).

Setagrotis dolens Sm. High River, Alta., (Baird).

1,455. *Agrotis geniculata* G. & R. Meach Lake, Que., near Ottawa, Aug. 31, (Fletcher); Truro, N.S., (DeWolfe); Toronto, (Gibson).

Rhizagrotis perolivalis Sm. High River, Aug. 25, (Baird).

1,544. *Feltia gladiaria* Morr. Trenton, (Evans). This is the first Canadian specimen we have seen.

1,600. *Paragrotis perfusca* Grt. Sudbury, Ont., (Evans).

1,682. *Paragrotis fuscigera* Grt. Olds, Alta., June 21, (Willing).

1,697. *Paragrotis dissona* Moesch. Aweme, Aug. 28, (E. Criddle).

Paragrotis cocklei Sm. Departure Bay, Aug. 7, (Young).

1,780. *Mamestra determinata* Sm. Trenton, at light, Aug. 27, (Evans).

1,783. *Mamestra detracta* Wlk. Trenton, July 31, (Evans).

1,789. *Mamestra capsularis* Gn. Among some noctuids named for Mr. Evans, was a specimen of this moth with the label "E. Ontario, Canada," on it. This is the first Canadian record we have.

1,797. *Mamestra gussata* Sm. Ottawa, April 24, (Young).

1,821. *Mamestra rugosa* Morr. Sudbury, (Evans).

1,825. *Mamestra goodellii* Grt. Peachland, B.C., July 18, (Wallis); Ottawa, July 24, (Saunders); Sidbury, (Evans); Mt. St. Hilaire, near Montreal, May 24, (Chagnon).

1,840. *Mamestra sutrina* Grt. Laggan, Aug. 4, (Fletcher).

1,894. *Xylomiges dolosa* Grt. Hymers, May 10, (Dawson).

2,024. *Graphiphora furfurata* Grt. Mt. St. Hilaire, near Montreal, July 2, (Chagnon). The true species (J. B. S.).

2,074. *Pleroma bonuscula* Sm. Victoria, (Fletcher). A new locality for the species, (J. B. S.).

2,108. *Xylina bayleyi* Grt. Duncans, B.C., April, (Day).

Hydrœcia micacea Esp. Specimens of this moth have been reared in the Division from larvæ received from Mahone Bay, N.S., (C. A. Hamilton); Westport, N.S., (Geo. Welch), and Tramore, Ont., (Capel B. St. George). As mentioned in Mr. Gibson's paper, in this report, the above and specimens of the moth taken at St. John, N.B., by Mr. W. McIntosh, and recorded by him under the name of *Hydrœcia medialis* Sm., are the only American records of this European insect.

2,214. *Tapinostola variana* Morr. Trenton, at light, Aug. 6, (Evans); Westbourne, Man., July 28, (Wallis).

Amathes duscata Sm. Aweme, Aug. 28, (E. Criddle).

Amathes acta Sm. Departure Bay, B.C., Sept. 5, (Young).

2,224. *Orthosia inops* Grt. Cartwright. Man., July 30, (Heath); Aweme, Aug. 25, (Fletcher); Aug. 30, (E. Criddle).

2,231. *Orthosia lutosa* Andrews, Peachland, B.C., July 6, (Wallis).

Orthosia verberata Sm. Bartlett Bay, off Glacier Bay, Alaska, June 10, (Nelles). A new locality for the species. (J.B.S.).

2,280. *Pippona bimatris* Harv. Aweme, (Fletcher). Quite a rare species. First Canadian record.

2,390. *Dasyspoudæa meadii* Grt. High River, Alta., (Baird).

2,423. *Heliaca nexilis* Morr. Several on summit of Hope Mts., B.C., July 20, (Harvey).

2,617. *Eustrotia includens* Wlk. Trenton, July 18, (Evans).

2,618. *Galgula hepera* Gn. and var. *partita* Gn. Mt. St. Hilaire, near Montreal, Aug. 30, (Chagnon). Mr. Winn has also taken the species at Montreal.

2,661. *Tarache terminimacula* Grt. Trenton, (Evans).

2,769. *Meliopotis limbolaris* Geyer. Lorne Park, Ont., July 25, (Williams).

2,830. *Catocala concumbens* Wlk. Metlakatla, B.C., (Keen); Fort Selkirk, Yukon, July, (Miss Seymour). Both of these records are of much interest; the latter is the most northern limit of *concumbens* known at the present time, (Beut.).

2,858. *Catocala coccinata* Grt. Westbourne, Man., Aug. 10, (Wallis).

2,871. *Catocala subnata* Grt. Billings Bridge, Ottawa, (Fletcher). First record for the district.

2,900. *Catocala præclara* G. & R., Digby, N.S., Sept. 17, (Russell).

Homoptera norda Sm. Chelsea, Que., near Ottawa, May 30, (Gibson); Ottawa, May 16, 18, (Young); Kaslo, (Cockle); Cartwright, (Heath).

2,900 *Homoptera minerea* Grt. Britannia, near Ottawa, June 20, (Baldwin). In the Entomological Record for 1906, this species is recorded from White River, Hudson Bay Slope, June 2, (Wilson). On further examination Dr. Smith could not confirm this identification, as the specimen was much rubbed and crushed.

2,991. *Homoptera calycanthata* S. & A. In the Entomological Record for 1904, this species is recorded from Kaslo. According to Dr. Smith's Revision of the Genus Homoptera, just published, this record should now refer to his new species *norda*.

3,000 *Homoptera unilineata* Grt. Winnipeg, June 2, (Wallis). Only Canadian record which we have.

3,002. *Homoptera duplicata* Bethune. As mentioned in the Ottawa Naturalist, Oct. 1908, the record of this moth having been taken at Wellington, B.C., (Taylor), should now refer to *largera* Sm. *Duplicata* has been taken at Digby, N. S., (Russell), and Truro, N.S., (DeWolfe).

Homoptera helata Sm. Britannia, near Ottawa, June 20, (Baldwin).

3,038. *Philometra hanhami* Sm. Trenton, Aug. 2, (Evans). An unexpected locality; all the specimens heretofore seen are from Winnipeg, (J.B.S.).

3,066. *Bomolocha bijugalis* Wlk. Cartwright, July 4; recorded previously from Winnipeg by Hanham, first I have taken, (Heath).

3,087. *Gnophæla latipennis* Bdv. Similkameen, B.C., July 22 and 24, (Sherman and Harvey).

3,317. *Eupithecia nevadata* Pack. Duncans, April, (Day).

Eupithecia quebecata Taylor MS. Digby, N.S., Sept. 19, (Russell); Rostrevor, Ont., Sept. 16, (Gibson). First Ontario record.

Eucymatoge togata Hbn. Digby, July 22, (Russell). Mr. Taylor says: "This is a specimen of the European *E. togata*, which I have placed on the American list. I have taken the species at Wellington, B.C. This Nova Scotian specimen is more typical than mine."

3,392. *Hydriomena speciosata* Pack. Departure Bay, B.C., Aug. 10, (Young).

Hydriomena manzanita Taylor. Goldstream, B.C., April 19, 1,000 feet, (Harvey).

Xanthorhœ fossaria Taylor. Victoria, May and June, (Harvey).

3,708. *Cymatophora wauaria* L. Mt. St. Hilaire, Que., June 30, (Chagnon).

3,747. *Sympherta tripunctaria* Pack. Departure Bay, Aug. 25, (Young).

3,799. *Alcis latifasciaria* Pack. Departure Bay, Aug. 22-28, (Young).

3,802. *Alcis latipennis* Hulst. Departure Bay, Aug. 3, (Young).

3,878. *Jubarella danbyi* Hulst. Duncans, April, (Day).

3,922. *Ennomos subsignarius* Hbn. As mentioned in the Ottawa Naturalist, Sept., 1908, enormous numbers of these moths visited Ottawa on July 23. Thousands appeared in all parts of the city.

4,040. *Leucobrephos brephoides* Wlk. Hymers, April 9, (Dawson). This is the first record we have for Ontario.

4,216. *Sesia pictipes* G. & R. Levis, Que., (Fyles).

4,221. *Sesia acerni* Clem. Ottawa, July 8, at light, (Fletcher).

4,496. *Nymphula obliteralis* Wlk. Larvæ found at Ottawa feeding on *Lemna trisula*, (Fletcher).

4,569. *Crambus bidens* Zeller. Aweme, Aug. 9, (Criddle); Mer Bleue, near Ottawa, July, (Young).

4,571. *Crambus trichusalis* Hulst. High River, (Baird); Regina, (Willing); Redvers, Sask., (A. J. Crocker).

4,608. *Crambus zeellus* Fern. Ottawa, July 15, (Gibson).

Crambus cockleellus Kearf. Kaslo, Aug. 10, 11, (Cockle).

Crambus dorsipunctellus Kearf. Rounthwaite, Man., July, (Marmont).

Crambus youngellus Kearf. Mer Bleue, near Ottawa, July 2-10, (Young).

Thaumatopsis gibsonella Kearf. Rostrevor, Ont., Sept. 2-16, (Gibson).

Eucosma annetteana Kearf. Cartwright, May 23, (Heath).

Eucosma medioviridana Kearf. Ottawa, Aug. 17-21, (Young).

5,239. *Ancylis mediofasciana* Clem. Cartwright, May 23, (Heath).

Enarmonia multilineana Kearf. Aweme, June 26, 29, (Criddle).

Gelechia terminimaculella Kearf. Aweme, June 13-16, (Criddle); Rounthwaite, June 15, (Marmont).

Gelechia alternatella Kearf. Aweme, May 12-25, (Criddle).

Coleophora elæagnisella Kearf. Ottawa. Larvæ abundant on *Elæagnus argentea*, moths emerged July, (Fletcher and Gibson).

6,257. *Lithocolletis lucidicostella* Clem. Ottawa, June 11, (Young).

6,301. *Lithocolletis basistrigella* Clem. Ottawa, bred from oak, March 11, (Young).

6,305. *Lithocolletis aceriella* Clem. Ottawa, June 16, (Young).

6,310. *Lithocolletis tilieacella* Chamb. Ottawa, July 17, (Young).

Lithocolletis fletcherella, Braun. Ottawa, bred from Oak, (Fletcher and Gibson).

Argyresthia laricella Kearf. Mer Bleue, near Ottawa, reared from terminal twigs of *Larix americana*, moths issued Ottawa, June 12-23, (Fletcher and Gibson).

6,608. *Hepialus hyperboreus* Moesch. Hymers, Ont., Aug. 23, (Dawson).

6,610. *Hepialus gracilis* Grt. Levis, (Fyles).

COLEOPTERA.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico).

18*c*. *Cicindela montana* Lec. Lethbridge. Alta., (Harms).

25*a*. *Cicindela audubonii* Lec. Lethbridge, April, (Harms).

25*d*. *Cicindela 10-notata* Say. Lethbridge, April, (Harms).

28. *Cicindela fulgida* Say. Westbourne, Man., Aug. 14, (Wallis). New to Manitoba.

32. *Cicindela vulgaris* Say. Lethbridge, (Harms).

33*c*. *Cicindela 12-guttata* Dej. Lethbridge, (Harms).

34. *Cicindela pusilla* Say. Westbourne, Aug. 14, seven specimens, showing great range of maculation from almost immaculate to very bright and evenly marked, (Wallis).

35. *Cicindela hirticollis* Say. Lachute, Que., Aug. 3, (Criddle and Fletcher).

119*c*. *Carabus oregonensis* Lec. Westbourne, Aug. 19, (Wallis).

148*b*. *Calosoma zimmermanni* Lec. Lethbridge, (Harms).

208. *Promecognathus lævissimus* Dej. Goldstream, B.C., 1,110 feet, July 4, (Harvey).

Amara thoracica Hayward. Mr. Evans has sent in the following record: 1 specimen collected by John Macoun in the N. W. T., in 1880.

990. *Zacotus matthewsii* Lec. Victoria, B.C., Feb. 20, (Harvey).

1,081. *Harpalus amputatus* Say. Vernon, Aug. 18, (Harvey). New to British Columbia.

1,102. *Harpalus innocuus* Lec. Vancouver, May 1, (Harvey).

1,404. *Matus bicarinatus* Say. St. Lambert, Que., Aug., (Chagnon).

1,465. *Rhantus notatus* Fab. Winnipeg, Sept. 11, (Wallis).

1,467. *Rhantus tostus* Lec. Winnipeg, July 24, Aug. 8, (Wallis).

1,482. *Dytiscus hybridus* Aubé. Winnipeg, May 24, (Wallis).

1,483. *Dytiscus verticalis* Say. Mahone Bay, N.S., May 20, (Miss Blanche Colp). Record sent by Dr. C. A. Hamilton, of Mahone Bay.

1,485. *Dytiscus sublimbatus* Lec. Winnipeg, May 8, (Wallis).

1.486. *Dytiscus marginalis* L. Winnipeg, May 8, (Wallis).

1,499. *Graphoderes cinereus* L. Winnipeg, July 4, (Wallis).

1,585. *Hydrophilus ovatus*, G. & H. Ottawa, at light, May 12, (Fletcher).

1,629. *Philhydrus bifidus* Lec. Winnipeg, Aug. 20, (Wallis).

2,627. *Tachinus crotchii* Horn. Vancouver, March 23, (Harvey).

3,074. *Mysia hornii* Cr. Vernon, (Venables).

3,076. *Anatis rathvoni* Lec. Victoria, April 11, (Harvey).

3,402. *Triphyllus humeralis* Kirby. Found in large numbers, near Montreal, in fungus, early May. Mr. Fall tells me that this belongs to the Malandryidæ and should be transferred to that family, (Chagnon).

Exoma pleuralis Casey. Metlakatla, B.C., (Keen).

4,001. *Helodes apicalis* Lec. Vancouver, April 14, (Harvey).

4,011. *Cyphon brevicollis* Lec. Wellington, April 17, (Harvey).

4,029. *Stethon pectorosus* Lec. Ste. Anne de Bellevue, Que., several found by Mr. Swain and me, in July, under bark of fallen tree, (Chagnon).

4,068. *Sarpedon scabrosus* Bonv. Vancouver, (Harvey). New record for British Columbia. Two specimens of this rare beetle were taken many years ago at Ottawa, (Harrington and Fletcher).

4,105. *Cardiophorus fenestratus* Lec. Vancouver, April 28; Victoria, July 8, (Harvey).

4,440. *Corymbites protractus* Lec. Vancouver, April 28, (Harvey). New to British Columbia.

4,450. *Corymbites tarsalus* Melsh. Vancouver, April 27, (Harvey). New record.

4,506. *Asaphes oregonus* Lec. Goldstream, July 4, (Harvey).
4,568. *Chalcophora angulicollis* Lec. Near Princetown, B.C., July 23, (Harvey).
5,467. *Aegiolia cylindrica* Esch. Vancouver, April 14, (Harvey).
5,528. *Aphodius granarius* L. Vancouver, May 9, (Harvey). New record.
5,923. *Cremastochilus pilosicollis* Horn. Vernon, in ants' nests in early spring, (Venables).
6,174. *Calloides nobilis* Say. Wakefield, Que., on oak, July 7, (Gibson).
6,223. *Desmocerus cribripennis* Horn. Hope Mts., B.C., July 17, (Sherman).
6,246. *Toxotus obtusus* Lec. Vernon, (Venables).
6,323. *Leptura instabilis* Hald. Vernon, on lupin, June, (Venables).
6,323*a*. *Leptura convexa* Lec. Vernon, on lupin, June, (Venables).
6,340. *Leptura quadrillum* Lec. Grouse Mt., Vancouver, B.C., July 9, (Sherman).
6,556. *Zeugophora consanguinea* Cr. Vernon, (Venables).
Acanthocinus ædilis S. A specimen of this fine European beetle was found at Ottawa among some packing in a box of chinaware received from Germany, (R. B. Whyte).
6,560. *Syneta simplex* Lec. Vancouver, Aug. 2, (Harvey). New record for British Columbia.
6,968. *Haltica evicta* Lec. Nicolum R., B.C., July 13, (Harvey).
6,988. *Epitrix subcrinita* Lec. Vernon, (Venables).
7,396. *Cœlocnemis dilaticollis* Mann. Penticton, B.C., (Mrs. Fowler). Record sent by Mr. Wallis.
7,721. *Rhinosimus æneirostris* Mann. Vancouver, April 14, (Harvey).
7,724. *Calopus angustus* Lec. Duncans, in a spider's web, March 15, (Hanham).
8,158. *Cantharis sphæricollis* Say. Princetown, B.C., July 22, (Harvey).
8,438. *Lepyrus geminatus* Say. Hope Mts., July 21, (Harvey).
8,543. *Erycus puncticollis* Lec. Under rotten logs on shore of Long Lake, March 31; on leaves of wild raspberry, same place, May 24, (Venables).
9,942. *Hister umbrosus* Casey. Vernon, under carrion, (Venables).
9,944. *Hister electus* Casey. Wellington, July 2, (Harvey). New record.
11,073. *Cryptorhynchus lapathi* L. Durndurn, Sask., in Carolina poplar. end May, (Dr. W. A. Wilson).

DIPTERA.

(Arranged according to a Catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI., No. 1,144. The numbers refer to the pages of the catalogue.)

92. *Eriocera longicornis* Walk. Mamamattawa River, Hudson Bay Slope, June 21; Little Current River, Hudson Bay Slope, July 8; Nagagami River, Hudson Bay Slope, June 20, (Wilson).
Anopheles occidentalis D. & K. Negagami R. 7th portage, June 7, (W. J. Wilson).
131. *Aedes sylvestris* Theob. Ottawa, June 20, 1901; June 18, 19, 1906, (Fletcher).
Aedes riparius, D. & K. Winnipeg, (F. Knab); Ottawa, June 11, (Fletcher).
Aedes campestris D. & K. Regina, June 14, 15; Carnduff, May 28; Qu'Appelle, June 9, (Willing).

131. *Culex restuans* Theob. Ottawa, Aug., Sept., (Fletcher).
133. *Tæniorhynchus perturbans* Wlk. Ottawa, June 20, July 1, (Fletcher).
167. *Dilophus breviceps* Loew. Mamamattawa River, June 21, (Wilson).
169. *Simulium bracteatum* Coq. Vancouver, April 24, (Harvey).
196. *Chrysops discalis* Will. Maple Creek, Sask., June 12, (Willing).
Chrysops lupus Whitney. Youghall, N.B., July 27, (Fletcher).This is of interest as it had not been taken so far east before, (J. S. H.).
202. *Tabanus carolinensis* Macq. Ottawa, May 20, (Fletcher).
203. *Tabanus epistates* O.S. Meach Lake, Que., near Ottawa, June 18, (Fletcher).
204. *Tabanus illotus* O.S. Megiskon River, Ont., July, (Wilson).
204. *Tabanus insuetus* O.S. Prince Albert, Sask., July 27, (Fletcher).
Tabanus osburni Hine. Banff, Aug. 2, (Fletcher).
206. *Tabanus punctifer* O.S. Vernon, July 11, (Venables).
207. *Tabanus septentrionalis* Loew. St. Albert, Alta., July 20, (Fletcher).
217. *Atherix variegata* Walk. Mamamattawa River, June 21, (Wilson).
Cophura albosetosa Hine. Hope Mts., B.C., July 19; Similkameen, July 20, (Harvey and Sherman).
Anthrax harveyi Hine. Hope Mts., July 20-23, (Sherman and Harvey).
236. *Bombylius lancifer* O.S. Bowen Island, Vancouver, B.C., May 24, reported by R. V. Harvey. First record for Canada, (J.S.H.).
236. *Bombylius metopium* O.S. Hope Mts., July, (Harvey). First record for Canada, (J.S.H.).
281. *Machimus avidus* Van der Wulp. Victoria, July 22, (Harvey). First record for Canada, (J.S.H.).
282. *Asilus angustifrons* Will. Goldstream, Vancouver Island, Aug, 20, (Harvey). First record for Canada, (J.S.H.).
347. *Chrysotoxum derivatum* Walk. Hope Mts., July 20, (Sherman).
348. *Chrysotoxum ypsilon* Will. Banff, Alta., one specimen, (Sanson). I recently recorded the first record for Canada from a specimen taken at Kaslo, B.C., in 1903, by Dr. Dyar. This Banff record is the first east of the Great Divide, and bears testimony to what I have written once or twice, that the various species of insects find distribution over the Divide much easier in Canada than in the Rockies further South. (R.C.O.).
361. *Melanostoma kelloggi* Snow. Mer Bleue, near Ottawa, June 19, (Fletcher).
Xanthogramma tenuis Osburn. Ottawa, Sept., (Fletcher). This is an exceptionally good find, (R.C.O.). The species was described in Can. Ent., Jan., '08, from a specimen taken in the Hope Mts., by Mr. R. V. Harvey.
367. *Syrphus pauxillus* Will. Gabriola Island, B.C., June 6, (B. R. Elliott).
Syrphus insolitus Osburn. Victoria, one pair, April 18, (Harvey).
385. *Eristalis compactus* Walk Banff, one specimen, (Sanson). Only one previous record for Canada, at Martin Falls, the type, (R.C.O.).
387. *Eristalis occidentalis* Will. Regina, June 18, (Willing). Much farther east than ever before recorded. I have specimens from Banff, the farthest eastern record previously, (R.C.O.).

389. *Eristalis transversus* Weid. Little Current River, July 16, (Wilson).

400. *Chrysochlamys crœsus* O.S. Victoria, B.C., July 1, one specimen, (Hanham); Goldstream, B.C., July 4, (Harvey). I recently published the first record for Canada based on a specimen taken by Harvey at Victoria, 8, VI., '06, (R.C.O.).

Specomyia occidentalis Osburn. Gabriola Island, June 6, (B. R. Elliott).

572. *Helomyza limbata* Thom. Grouse Mt., July 9, (Sherman). First record for Canada, (J.S.H.).

HYMENOPTERA.

In last year's Record mention was made of some Bombi which had been determined by Mr. H. J. Franklin. During the past year further collections of these insects have been examined by Mr. Franklin, and from a complete list of the species named by him, the following are thought worthy of mentioning here. Unfortunately, little work seems to have been done in the important order of hymenoptera in Canada during the year, consequently very few other records have been received.

Bombus praticolus Kirby. St. Albert, Alta., (Fletcher); Metlakatla, B.C., (Keen).

Bombus mixtus Cress. Metalakatla, (Keen); Mt. Cheam, B.C., (Fletcher); Banff, Alta., (Sanson).

Bombus appositus Cress. Kelowna, B.C., (Fletcher).

Bombus edwardsii Cress. Mt. Arrowsmith, B.C., Duncans, B.C., (Fletcher); Banff, (Sanson).

Bombus kirbyellus Curtis. Bartlett Bay, Alaska, at sea level, (Nelles). One of the rarer species (H.J.F.).

Bombus borealis Kirby. Beaver Lake, Alta., (Halkett). Not a very common species, (H.J.F.).

Bombus sitkensis Nylander. Mt. Cheam, (Fletcher); Skagway District of Northern British Columbia, (G. White-Fraser).

Bombus californicus Smith. Olds, Alta., (Willing); Duncans, (Fletcher). Not very common in western Canada; not present in eastern Canada, (H.J.F.).

Bombus nigroscutatus Franklin MS. Skagway District of Northern British Columbia, (G. White-Fraser). Apparently rare in Western Canada; not present in eastern Canada, (H.J.F.).

Bombus terrestris, var. *moderatus* Cress. Banff. (Sanson). Rare in Western Canada; not present in the east, (H.J.F.).

Bombus couperi Cress. Nepigon, (Fletcher); Anticosti, (Dr. Jos. Schmitt). One of the rarer species, (H.J.F.).

Bombus rufocinctus Cress. Ottawa, Sept. 20, (Fletcher); Radisson, Sask., (Fletcher). This species is rare in eastern Canada, and extremely variable in colouration, (H.J.F.).

Bombus vagans Smith. Rostrevor, Muskoka, Ont., Sept., (Gibson); Regina, Sask., Banff, (Fletcher); Westbourne, Man., Aug. 26, (Wallis).

Bombus virginicus Oliv. Mer Bleue, near Ottawa, June 6, (Gibson).

Psithyrus consultus, Franklin, MS. Nelson, B.C., Mt. Cheam, Regina, (Fletcher).

Psithyrus suckleyi, Greene, Duncans, Banff; Mt. Arrowsmith, (Fletcher).

Prosopis basalis, Smith. Winnipeg, June 10, (Wallis).

Pompilus terminatus, Say. Penticton, B. C., Aug., (Miss B. Farmer).
Ichneumon feralis, Cress. Winnipeg, Aug. 23, (Wallis).
Ichneumon caliginosus, Cress. Westbourne, Man., Aug, 24, (Wallis).
Ichneumon acerbus, Cress. Treesbank, Man., April 17, (Wallis).
Rhyssa persuasoria, L. Hymers, Ont., Sept. 6, (Dawson).
Ephialtes gigas, Walsh. Hull, Que., June 13, (Gibson).
Thyreodon morio, Fab. Stonewall, Man., July, (Wallis).
Macrophya oregona, Cress. Hope Mts., July 17, (Harvey).
Tenthredo melanosoma, Hartg. Hope Mts., July 17, (Harvey).

HEMIPTERA.

Several collectors have, during the year, given special attention to the hemiptera. Most of the species mentioned below were identified by Mr. E. P. Van Duzee. The Ottawa species, probably none of which are very rare, are included as they are the only records we have for the district.

Telamona reclivata, Fitch. Ottawa, July 14, (Metcalfe); Sept. 2, on basswood, (Groh).

Telamona ampelopsides, Harr. Ottawa, July 14, (Gibson).

Cyrtolobus vau, Say. Ottawa, June 29, on red oak, (Fletcher).

Cyrtolobus griseus Van D. Ottawa, on oak, Aug. 25, (Metcalfe).

Scolops sulcipes, Say. Ottawa, Sept. 5, on Goldenrod, (Groh).

Liburnia foveata, Van D. Mer Bleue, near Ottawa, June-Sept., (Metcalfe).

Aphrophora signoretii, Fitch. Regina. Sask., Aug. 8, (Fletcher).

Bythoscopus pruni, Prov. Ottawa, June 21, (Gibson).

Gypona flavilineata, Fitch. Ottawa, Sept. 7, (Gibson).

Gypona scarlatina, Fitch. Wakefield, Que., July 7, (Gibson).

Gypona albosignata, Uhl. Trenton, Ont., Sept. 1, (Evans).

Deltocephalus abdominalis, Fab. Near 60 Mile River, along 141 Meridian, Yukon Territory, (P. Reilly).

Phlepsius irroratus, Say. Ottawa, Oct. 8, (Fletcher).

Athysanus extrusus, Van D. N.W.T., 1881, (John Macoun); record sent by J. D. Evans.

Dorycephalus platyrhynchus, Osborn. Aweme, Man., July 13, (Fletcher).

Typhlocyba bifasciata, G. & B., Ottawa, June 22, (Gibson).

Cicadula 6-notata, Fall. Ottawa, on aster, Aug. 31, (Fletcher).

Thyreocoris unicolor, P. B. Aylmer, Que., in pappus of *Sonchus arvensis*, Aug. 29, (Groh).

Eurygaster carinatus, Van D. Vernon, B. C., June 6, (Venables).

Carpocoris remotus, Harvath. Vernon, Aug. 12, (Venables).

Brochymena affinis, Van D. Peachland, B. C., June 27, (Wallis).

Leptoglossus occidentalis, Heidemann MS. Vernon, B.C., Sept. 27, (Venables).

Nysius scolopax, Say. Vernon, (Venables).

Geocoris decoratus, var. *solutus* Mantodon. Ottawa, June 4, (Fletcher).

Geocoris limbatus, Stal. Mer Bleue, near Ottawa, uncommon, (Metcalfe).

Geocoris uliginosus, var. *limbatus*, Stal. Vernon, Sept. 4, (Venables).

Lygus monachus, Uhl. Ottawa, on basswood, July 1, (Metcalfe).

Lygus tenellus, Uhl. MS. Ottawa, on basswood, June 25, (Gibson).

Lygus invitus, Say. Ottawa, on basswood, June, (Metcalfe).

Calocoris bipunctatus, Fab. Annapolis Royal, N.S., (V. A. Eaton).

Neoborus pettiti, Uhl. MS., Ottawa, on white ash, Aug., (Metcalfe).

Neoborus saxeus, Dist. Ottawa, on white ash, Aug., (Metcalfe).

Plagiognathus obscurus, Uhler, Aylmer, Que., near Ottawa, Aug. 29, (Groh).

Triphleps tristicolor, White. Ottawa, Dec. 6, (Fletcher).

Gerris sulcatus, Uhl. Beaver Meadow, Hull, Que., May; Toronto, April, (Metcalfe).

Gerris rufoscutellatus, Latr. Ottawa, May; Toronto, April 1, (Metcalfe).

Acanthia ligata, Say. Little Current River, Hudson Bay Slope, July 11, (Wilson).

Corythuca marmorata, Uhl. Ottawa, rare, June, (Metcalfe).

Microvelia americana, Uhl. Beaver Meadow, Hull, May, (Metcalfe).

Acanthia humilis, Say. Ottawa, (Metcalfe).

Acanthia confluens, Say. Ottawa, (Metcalfe).

Acanthia reperta, Uhl. Ottawa, (Metcalfe).

Acanthia signoretii, Guer. Ottawa, (Metcalfe).

Ranatra quadridentata, Stal. Pickerel point on Ottawa River, near Ottawa, July, (Metcalfe).

Ranatra kirkadyi, Bueno. Ottawa, ,(Metcalfe).

Hydrometra martini, Kirby. Ottawa River, Pickerel Point, July, (Metcalfe).

ORTHOPTERA.

During the year some good work has been done in this important order. Dr. E. M. Walker writes: "I have examined some 800 specimens from the Prairie Provinces and British Columbia, collected chiefly by Messrs. T. N. Willing and N. Criddle, Prof. W. J. Alexander and the late Dr. Fletcher. These will form the basis of a paper which I have about completed. Besides this material I have yet to report on collections made at Go Home, Georgian Bay, the Temagami region, Fort William and Nepigon, Ont."

The following records have been sent in by Dr. Walker as worthy of being included here:—

Nomotettix cristatus (Scudd.). Go Home, Georgian Bay, June-July, 1907, (Walker).

Tettix acadicus, Scudd. Temagami, Sept, 1908; Fort William, Aug. 1907, 1 female (Walker); Aweme, Man., May-June, 4 males, 5 females (Criddle).

Tettix brunneri, Bol., Temagami, Sept., 1908, 1 male, long-winged, (Walker).

Platybothrus brunneus, (Thom.). Regina, Sask., June 5, 1903, 1 male, (Willing).

Encoptolophus parvus, Scudd. Aweme, Sept. 6, 1907, 1 male, (Criddle); Walsh, Sask., Aug. 23, 1901, 4 males, 12 females; Regina, Sept. 19, 1903, 1 female, (Willing).

Hippiscus neglectus, (Thom.). Aweme, July 14, 1904, 2 females, (Criddle).

Cirootettix undulatus, (Thom.). Cowley, Sask., July 29, 1901, 1 female; Medicine Hat, Oct. 1, 1903, 1 female, (Willing).

Circotettix carlinianus, (Thom.). Maple Creek, Sask., Aug. 2, 1902, 1 female, (Willing).

Melanoplus angustipennis, (Dodge.). Aweme, Aug. 18, 1906, 1 male, (Criddle).

Melanoplus angustipennis coccineipes, Scudd. Aweme, July, Aug., Oct., 1904-07, 4 males, 1 female, (Criddle).

Melanoplus foedus, Scudd. Swift Current, Sask., Aug. 5, 1901, (Willing).

Phoetaliotes nebrascensis, (Thom.). Walsh, Sask., Aug. 23, 1901, 1 short-winged female, teneral, (Willing).

Oecanthus quadripunctatus, Beut. Aweme, Aug-Sept., 1904, 2 males, 2 females, (Criddle).

ODONATA.

Some interesting collections of these insects have been made in 1908, and much material collected in previous years, has been gone over and carefully identified. Dr. E. M. Walker has been most helpful in naming material, and we are all very grateful to him for his continued kindnesses. Dr. Walker says: "In the Odonata, about 400 specimens from the Prairie Provinces have been examined. These were taken by Messrs. Willing, Criddle, Alexander, Fletcher, and Wallis. A list of these will give a fair idea of the Odonata fauna of this region, which is at present a *terra incognita* in this order. A considerable number of species was also collected by Mr. A. G. Huntsman, of the Biological Department, University of Toronto, at the new marine Biological Station on Vancouver Island, B.C. A good deal of material from the East has also been gone over. It comprises collections from the vicinity of Sault Ste. Marie, belonging to Mr. E. B. Williamson, of Bluffton, Ind., from Georgian Bay, Fort William, Nepigon and Temagami, made by the writer, and from Youghall, New Brunswick, by Mr. Arthur Gibson."

Dr. Walker has provided the following records:—

Lestes congener, Hagen. Aweme, Man., Aug. 29, 1907, 1 male, (Criddle); Westbourne, Man., July-Aug., 5 males, 6 females, (Wallis).

Nehalennia irene, Hagen. Westbourne, Man., July 27-29, 1908, 1 male, 2 females; Winnipeg, July 7, 1908, 1 male, 1 female, (Wallis).

Agrion lunulatum, Evans. Aweme, July 4, 1905, 1 male, (Criddle); Winnipeg, July 6, 1908, 1 male, (Wallis); Carnduff, June 18, 1905, 1 male; Regina, 2 males, 1 female, (Willing). This is the first time this Old World species has been reported from North America. I had thought it a new species, but Mr. K. J. Morton, of Edinburgh, Scotland, who has specimens from Redvers, Sask., pointed out to me its true relationship. The Canadian specimens differ slightly from European ones with which they have been compared and may be distinct, but more material will be necessary to determine the point (E. M. W.).

Agrion resolutum, Hagen. Youghall, N.B., July 20, 1908, 1 male, (Gibson); Little Carp River, Algoma, Ont., June 29, July 6, 1907, 5 males, 2 females, (Donaldson); Winnipeg, Man., July 7, 1908, 1 male, (Wallis).

Enallagma civile, Hagen. Winnipeg, July 9, 24, 1 male, 1 female, (Wallis).

Aeshna sitchensis, Hagen. Westbourne, Aug. 19, 1 male, (Wallis).

Aeshna constricta, Say. Westbourne, July 29, Aug. 26, 1 male, 3 females. This is the extreme northwestern limit of this species' range, so far as known, (E. M. W.).

Somatochlora forcipata, Scudd. Silver Creek Falls, Algoma, July 9, 1907, 1 male, (Donaldson).

Cordulia shurtleffi, Scudd. Silver Creek Falls, July 9, 1907, 1 male, (Donaldson); Youghall, N.B., July 18, 1 male, (Gibson).

Leucorhinia borealis, Hagen. Aweme, July 15, 1907, 1 female, somewhat teneral, (Criddle). This species is but little known and is represented in very few collections. The determination was verified by Dr. Calvert, (E. M. W.).

NEUROPTEROID INSECTS. (EXCEPT ODONATA.)

During the year some small collections of neuropteroid insects have been submitted to specialists. The names of some of the species have been received; others have not yet been reported upon. The species mentioned as having been collected by Mr. W. J. Wilson, of the Geological Survey, Ottawa, were taken in the Hudson Bay Slope, and, through the courtesy of Dr. L. O. Howard, have been recently identified by Dr. Nathan Banks, who also examined Mr. Wallis' specimens. The numbers below refer to the pages in Dr. Banks' catalogue published in 1907 by the American Entomological Society.

ARCHIPTERA.

10. *Pteronarcys regalis* Newm. Winnipeg, June 1, (Wallis).
11. *Isogenus frontalis*, Newm. Kabina Kagami River, Aug. 1, (Wilson).
13. *Isoperla bilineata*, Say. Little Current River, July 16, (Wilson).
13. *Isoperla ebria* Hag. Treesbank, Man., June, (E. Ellis).
14. *Nemoura perfecta*, Walk. Little Current River, July 20, (Wilson).
15. *Capnia vernalis*, Newp. Mamamattawa River, June 21, (Wilson).

NEUROPTERA.

21. *Chauliodes californicus*, Walk. Kaslo, B.C., July 27, (Cockle).
22. *Sialis infumata*, Newm. Little Current River, July 16, (Wilson); Norman, Ont., July 19, (Wallis).
33. *Panorpa rufescens* Ramb. Winnipeg, July 1, (Wallis).
34. *Boreus californicus*, Pack. Kaslo, on snow, (Cockle), Banff, (Sanson).

TRICOPTERA.

35. *Phryganea improba*, Walk. Westbourne, Man., Aug. 5, (Wallis).
36. *Glyphotælius hostilus*, Hag. Kabina Kagami River, Aug. 1, (Wilson).
36. *Limnephilus indivisus*, Walk. Westbourne, Aug. 17, (Wallis).
36. *Limnephilus extractus*, Walk. Westbourne, Aug. 20, (Wallis).
Limnephilus moestus, Banks. Westbourne, Aug. 20, (Wallis).
37. *Limnephilus ornatus*, Banks. Winnipeg, June 19, (Wallis).
37. *Anabolia bimaculata*, Walk. Westbourne, Aug. 1, (Wallis).
37. *Colpotaulius medialis*, Banks. Westbourne, Aug. 20, (Wallis).
37. *Colpotaulius perpusillus*, Walk. Westbourne, Aug. 20, (Wallis).
38 *Pycnopsyche similis*, Banks. Kabina Kagami R., Aug. 11, (Wilson).
42 *Brachycentrus fuliginosus*, Walk. Nagagami R., Station 52, June 23, (Wilson).
45. *Leptocerus resurgens* Walk. Westbourne, Aug. 1, (Wallis).
46. *Œcetina avara* Banks. Westbourne, July 28, (Wallis).
47 *Hydropsyche cockerelli*, Banks. Nagagami R., June 6, (Wilson).

ARANEIDA.

Among some insects brought back from the Hudson Bay Slope in 1903 by Mr. W. J. Wilson, of the Geological Survey, Ottawa, was a small collection of spiders. These have recently been kindly named by Dr. Banks, through Dr. Howard. Owing to the northern locality at which the specimens were collected the list is given in full.

Epeira silvatica, Em. Kabina Kagami River, Aug. 11.
Epeira patagiata, Clerck. Mamamattawa River, June 21.
Gnaphosa conspersa, Th. Nagagami River, June 15.
Amaurobius bennetti, Blk. Nagagami R., June 6.
Tetragnatha extensa, L. Little Current River, July 16.
Lycosa pratensis, Emer. Kabina Kagami River, Aug. 11.
Lycosa kochi, Keys. Kenogami River, July 2.
Agrœca pratensis, Emer. Kabina Kagami River, Aug. 9.
Agalena nœvia, Htz. Little Current River, July 17.

INSECTS OF THE YEAR 1908 AT OTTAWA.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

The season of 1908, at Ottawa, has been a remarkable one, owing to the long continued drought. The months of June, July, August and September were particularly dry, the rain fall from the end of May till the beginning of October being only 6.80 inches. Vegetation consequently suffered very severely, but insects were more plentiful than usual and some serious outbreaks occurred.

Early in the season Cankerworm larvæ were abundant, their attacks being specially noticed on basswood, beech and birch. These insects seem to be on the increase again. The injury ceased about the 15th June, after which date very few caterpillars were noticed.

The American Tent Caterpillar, *Malacosma americana*, Fab., is also on the increase. On May 16th the work of the young caterpillars was very conspicuous on many trees near the city. On May 30th a large number of the nests were noticed at Chelsea, Que., about 7 miles from Ottawa. At that date some small wild cherry trees were almost stripped of their foliage.

On the same date at Chelsea, I found a nest of caterpillars of *Archips fervidana* on red oak. The nest was rather conspicuous, being several leaves drawn together somewhat in the shape of a ball. The caterpillars were all inside. This insect is better known in the United States where it has been recorded as destructive to several kinds of oak. In the Ottawa district it has never appeared commonly. When mature the caterpillar is nearly an inch long, of a yellowish-green colour, with the head and thoracic shield black. Moths from the above larvæ emerged on July 20th.

The Turnip Flea Beetle, *Phyllotreta vittata*, Fab. This small, very active, shining, black beetle was very troublesome in many gardens. The beetles did much harm to young turnips and were also very destructive to the first sowing of radishes. Where Paris green and land plaster, or Paris green and flour, were dusted on the plants, one pound of the former to 20 of the latter, the injury was soon stopped.

Root Maggots were more abundant than in 1907. The flies of the Radish Maggot were noticed flying around the young plants on May 16th. About the middle of June many plants examined were seen to be infested.

Unfortunately there is nothing new in the way of a remedy, that we know of, for these very destructive insects. For radishes preparations containing carbolic acid, applied once a week after the plants appear above ground, until they are ready for the table, have given about the best results.

The Hessian Fly, *Mayetiola destructor*, Say., was present, in the district, in destructive numbers in spring wheat. Plants were noticed to be infested about the end of May, and in some places the attack was quite serious. On the Central Experimental Farm, in fields where the soil was poor and where the unfavourable weather conditions had weakened the plants, probably as many as 50% were infested by the Hessian Fly. In other fields where the soil was better, the plants were stronger and better able to withstand the unfavourable conditions of the season, and in these fields the loss from Hessian Fly would amount to about 5%. From collected material, both sexes of the flies emerged in the Division on June 20th, 22nd and 23rd.

For some years we have noticed at Ottawa, that the young leaves of spinach were fastened together at the tips of the shoots by a small lepidopterous larva. This year we made some observations on the insect and were successful in rearing the moths, specimens emerging on July 18th. It is one of the micros and we hope soon to have its determination. During the present year the insect was particularly abundant, and in my own garden, and one or two others which I visited, it practically rendered every plant unfit for use.

Sparganothis flavibasana, Fern. This interesting and rare tortrix was again destructive to the Caprifolium group of Loniceras in the Arboretum and Botanic Garden of the Central Experimental Farm. The larvæ were quite numerous on some of the bushes. In 1907, however, they were in much greater numbers and did very noticeable damage. The caterpillar draws together the upper pair of leaves, fastening the same along the edges, so that the newly formed berries and itself are within this tent-like structure. Their presence on a bush is thus easily detected. The injury is done chiefly to the cluster of young berries, or immature fruit, which is eaten, and among which the caterpillar makes a web of whitish silk. In 1907, the larvæ were plentiful on June 19th, and many specimens were collected by Mr. Kearfott and me, from which moths were reared on July 2nd to July 6th. This year larvæ were collected on June 6th, from which we got moths on June 27, 29, 30 and July 9. Pupæ were also found where the larvæ had been feeding. When mature the caterpillar is 15 mm. long when at rest, 17 mm. long when extended. It is cylindrical in shape, bright apple green in colour, and the segments are wrinkled. Dorsal vessel distinct. No markings on the skin. The head is black and shining. The thoracic shield is black, margined in front with white. Tubercles on body are inconspicuous, each bearing a single pale, slender, hair. The feet are all concolorous with the body.

Eriophyes species. The small pocket galls of the genus *Eriophyes* were very noticeable during the past season. The foliage of elm, basswood, maple and wild cherry were particularly disfigured by the work of these mites. Basswood trees were examined on June 12th and were found to be heavily infested by *Eriophyes abnormis*, Garm. Quite a few of the galls were on the under side of the leaves. The leaves of the soft maples, at Ottawa, have been much disfigured of late years by the galls of *Eriophyes quadripes*, Shimer.

At an excursion of the Ottawa Field-Naturalists' Club, held to the Mer Bleue, and nearby vicinity, on June 20, some interesting material was collected. The Mer Bleue is an extensive peat bog, about 12 miles from Ottawa, and is one of the best hunting grounds which we have in the district. The small, curious caterpillars of the plume moth, *Pterophorus eupatorii*, Fern., were found in numbers feeding on the leaves of the Joe Pye Weed, *Eupatorium purpureum*, L., and in some pasture fields the Hard Hack, *Spiræa tomentosa*, L., was seen to be badly infested by a cecidomyid. Many of these plants were entirely covered by these galls. Since, the small fly has been reared and specimens have been determined by Dr. E. P. Felt, as *Rhabdophaga salicifolia*, a species which has been found abundant in Massachusettes and New York on the above plant and also on the Common Meadow-sweet, *Spiræa salicifolia*, L. A single worn specimen of the rare butterfly, *Argynnis triclaris*, Hbn., was taken in the Mer Bleue by Mr. Young. On June 9th three fine examples of this insect were captured in the bog, one by Mr. Criddle, one by Mr. Young, and the other by the writer. Dr. Fletcher has, once or twice previously, collected this butterfly at the Mer Bleue, which is probably the most southern locality known for this insect.

The Fall Webworm, *Hyphantria textor*, Harr., was particularly abundant all over the district. Their conspicuous nests were present in large numbers on willow, maple, elm, birch, apple, hawthorn and wild cherry. On July 25th the caterpillars were about half an inch in length and a little over a week later they were nearly an inch long. It is a pity, and a disgrace to every one who has trees, that this insect is allowed to increase to such an extent and render trees so unsightly by the conspicuous nests made by the larvæ. It is a simple matter for hundreds of owners of trees to cut off these nests when they are first noticed, and trample upon the caterpillars under foot.

The Snow-white Eugonia, *Ennomos subsignarius*, Hbn. On the evening of July 23rd last, enormous numbers of these moths appeared in all parts of the city, being attracted to the electric lights. An account of this visitation is given in the *Ottawa Naturalist*, September, 1908. The large numbers of these insects present on that evening caused a good deal of comment. Some of the electric light poles and the sides of buildings were literally covered with the moths and looked as if they had been whitewashed, or given a coat of white paint. The sparrows of the city had a great feast early the following day. Next morning the wings of the insects were to be seen all along the main streets. At the entrance to some of the larger buildings, the wings were so numerous that some little time had actually to be taken to sweep them away. In Dr. E. P. Felt's valuable report for 1907, which has just come to hand, it is stated that the caterpillars of this moth were found in immense numbers defoliating beech trees in Ulster County, New York, during the summer of that year. Possibly they were present in large numbers in other districts. These caterpillars when seen, were mostly mature, and were pupating by July 26th. Moths from these larvæ emerged soon afterwards and eggs were deposited. The insect, therefore, has been steadily increasing for the last two or three years. No caterpillars have been seen in the Ottawa district during the present season, and it would be most interesting to know where all the moths came from. Their sudden great abundance was certainly remarkable. According to the meteorological observations taken at the Central Experimental Farm, by Mr. W. T. Ellis, there were no strong winds at Ottawa during the week beginning July 19th, nor in fact during the week previous to that. The prevailing winds from July 19th to July 25th were south and southwest, but the word "calm" in Mr. Ellis' report signifies that there was practically no wind blowing when the records were taken. During the whole week above mentioned the number of miles recorded is only slightly over 191, while the average of wind for a week is over 900. Of course, the upper ents may have been very much stronger.

The occurrence of the Apple Leaf Hopper, *Empoasca mali*, LeB., in such enormous numbers was undoubtedly the most notable outbreak of the year in Eastern Ontario. At Ottawa injury was done chiefly to potatoes, although beans and other vegetables were severally attacked. The presence of the insects in destructive numbers was noticed towards the end of June, and the injury continued throughout the summer. These insects, which are pale green in colour, slender, about an eighth of an inch in length when mature, feed on the under sides of the leaves by sucking the juices out of the plants. When they are young and before they have developed wings, they can be destroyed by spraying the infested crop with whale oil soap, one pound in five gallons of water, or with the ordinary kerosene emulsion. Some potatoes which were sprayed early in July, before the young leaf hoppers acquired their wings, were freed from the pest, and were not since injured to any appreciable extent. The severity of this outbreak has been much aggravated this season by the exceptional drought and heat, which weakened the plants, and made them more than usually susceptible to injury by the insects.

The Potato Flea-beetle, *Epitrix cucumeris*, Harr., was present in potato fields in the district in considerable numbers. On August 21st it was found to be abundant on potatoes on the Experimental Farm, working with the Apple Leaf Hopper, *Empoasca mali*. This flea-beetle is sometimes, in hot dry seasons, one of the worst enemies of the potato. Dr. Fletcher recommends spraying the vines with Bordeaux mixture, as this treatment has given far better results than spraying with Paris green.

In early August the Destructive Pea Aphis, *Nectarophora pisi*, Kalt., did severe injury to sweet peas in gardens. The plant lice were present in large numbers and from specimens collected later, a number of parasites of the genus *Praon* were reared. The parasitized plant lice were rather numerous on the vines. Field peas near Ottawa were also much attacked by this pest, several complaints of very serious injury being received at the Division.

Other kinds of plant lice were much in evidence during the season. Apple trees were badly infested by the Apple Aphis. Some young trees examined on August 12th were practically covered with the aphides. Some seedlings were sprayed on August 8th with whale oil soap, 1 lb. to 4 gallons of water, and with the ordinary kerosene emulsion, but neither of these mixtures killed all of the insects. The kerosene emulsion did the better work. Vegetable marrows were much reduced in vitality by the attacks of an aphis. Towards the end of the season, Swede turnips, cabbages, and cauliflowers, were attacked by the Turnip and Cabbage Aphis. Early in October, celery plants were severely injured by plant lice, and many rendered useless. The Woolly Aphis of the Apple and the Woolly Aphis of the Alder were also more than usually abundant.

Cutworms, as usual, did much harm in some gardens early in the season. At East Templeton, near Ottawa, they destroyed many tobacco plants. Mr. Letourneau, of our office, who visited the locality early in August, reported to me that cutworms had been much complained of by the farmers of the district. A rather interesting occurrence of the Variegated Cutworm, *Peridroma saucia*, Hbn., was discovered in one of the greenhouses at the Central Experimental Farm, on August 24th. On September 1st, larvæ about ½ an inch long were brought into the Division. In all about 75 larvæ were collected, which had been found feeding on Primulas. No other plants were injured. In confinement they grew rapidly and buried on September 12th, 13th and 14th, the moths emerging in the office on October 20th and 22nd. (Fig. 31).

The caterpillars of the Small White Cabbage Butterfly, *Pontia rapæ*, L., were very troublesome in the Ottawa district during the past season, and many market gardeners complained of their ravages. The remedy of dusting the plants with pyrethrum insect powder, 1 lb. in 4 lbs, of cheap flour, after the whole has been mixed together and kept in a tight jar for 24 hours, is so simple that it is most remarkable that the annual loss by this insect is allowed to take place.

The Codling Moth, *Carpocapsa pomonella*, L., was injuriously present in many orchards in the district. A number of trees near the city were examined on August 12th, and it was estimated that about 25% of the apples on some of the trees were wormy.

The work of the Pear-tree Slug, *Eriocampa cerasi*, Peck., (Fig. 32), which does much harm to pears, cherries and plums, was noticed on plum trees on August 25th. Many of these slimy, greenish-brown, slug-like, larvæ were present on the trees and had done very apparent injury to the foliage. Specimens were found as late as October 5th feeding on the leaves. Spraying with any of the recognized poisonous mixtures, or dusting the trees at short intervals with freshly slaked lime, will destroy the larvæ.

Many householders complained of the ravages of the Clothes Moth. This insect was certainly very abundant in Ottawa during the past summer and did a great deal of damage to furs and woollen goods in houses. The best remedies for these insects are of a preventive nature. All articles liable to attack should be well shaken, brushed, and put away before the moths appear in the spring. As the caterpillars feed only on substances of animal origin, clothing, etc., to be protected may be wrapped tightly in linen, cotton or paper, and left in this way until required for autumn and winter use.

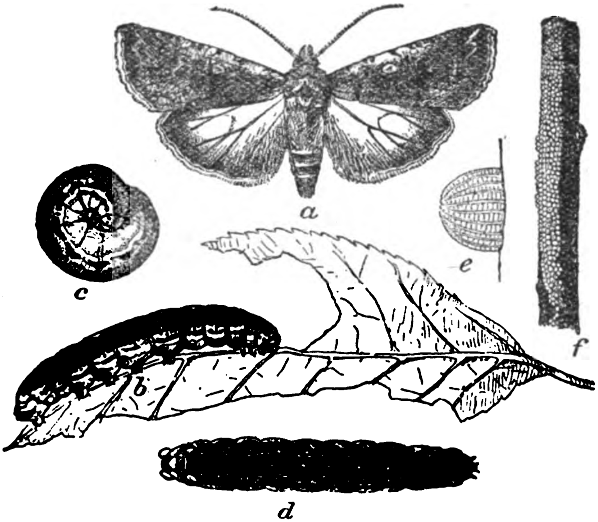

Fig. 31. *Peridroma Saucia; a*, moth; *b*, normal form of larva, lateral view; *c*, same in curved position; *d*, dark form, dorsal view; *e*, egg from side; *f*, egg mass on twig (after Howard, Division of Entomology, U. S. Dept. Agriculture).

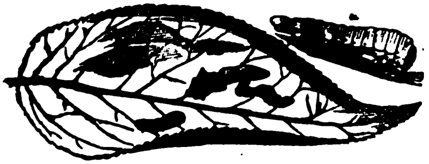

Fig. 32. Pear-tree slug.

PRESENT CONDITION OF THE WORK CONNECTED WITH THE IMPORTATION OF THE FOREIGN PARASITES OF THE GIPSY MOTH AND THE BROWN-TAIL MOTH.

By L. O. Howard, Washington, D.C.

In sending this paper to be read before the forthcoming meeting of the Entomological Society of Ontario, the writer assumes that the members of the Society, through the reports by Doctor Fletcher and through the reading of reports published by the Bureau of Entomology of the U. S. Department of Agriculture, as well as from the lecture delivered before the Society last year by Mr. A. H. Kirkland, are informed concerning the progress of this work down to the close of 1907, and what follows is supplementary to that information.

In the autumn of that year the parasite laboratory was moved from Saugus, Mass., to Melrose Highlands, Mass. The new location is much more accessible to Boston and to most of the field colonies of the parasites. The buildings, including several substantial structures built for laboratory purposes by the State of Massachusetts, are much beter fitted for the work. Upon the whole the results of the year's importations have been very promising.

In planning the work several new features have been introduced. The parasites that are constantly being sent over by agents belong to three main groups, namely those of the order Hymenoptera, including the Ichneumon flies, the Chalcis flies and others; those of the order Diptera, including the Tachina flies, and those of the order Coleoptera, including the predaceous ground beetles. The amount of material received has been so great, and the character of the different life histories of the insects involved has been so diverse that it has seemed of great importance to have a thoroughly trained expert, skilled in the biology of each group, placed in charge of each group. This has been done, and an expert has had charge of the Hymenoptera, another of the Diptera, and another of the Coleoptera.

Further, the condition of European sendings by mail and by express during the summer of 1907 was by no means uniformly good. The sendings from eastern Europe which are subject to long railway journeys in addition to the sea voyage, frequently arrived in bad condition. Therefore an innovation was made and a general laboratory depot was established at Rennes, France, under the general supervision of Mr. René Oberthür, and a skilled assistant, Mr. A. Vuillet, was placed in specific charge. Nearly all of the European sendings were shipped to Rennes, were examined, repacked, carried personally by Mr. Vuillet to Cherbourg or to Havre on the known days of sailing of certain steamers, then placed in the hands of the chief stewards of the vessels and carried in the cold room to New York where they were admitted without customs examination and sent direct to Boston. This method has resulted in a much beter average condition of the material received, and has facilitated the rapidity with which the work is being accomplished. The courtesy of the steamship officials is highly appreciated.

The third innovation has been an attempt to secure Japanese parasites of the gipsy moth. It has been known for some years that the true gipsy moth, or one of its varieties, or at least a most closely related species, occurs in Japan, though not in great numbers, and that it is apparently held in check by its parasites. Rev. H. Loomis, an American living in Yokohama, has repeatedly written to the State authorities of Massachusetts and to the

Chief of the Bureau of Entomology conveying this information, and attempts have been made by mail and otherwise to send these parasites to the United States, but without success. Later information received from one of the most skilled economic entomologists of Japan, Mr. Nawa, indicated that there exists in Japan an important egg-parasite of the gipsy moth. Remembering that the Massachusetts gipsy moth came originally from Europe it seemed altogether desirable to introduce first the European parasites, and it seemed probable that these would by themselves reestablish the balance of nature. Then too, the importation of the Japanese species seemed somewhat dangerous, on account of the chance that the Japanese Gipsy moth might prove even more voracious and destructive than the European moth; but, after consideration, it was thought best to leave no stone unturned and to neglect no chances in the search for effective parasites. The European service of collectors and agents and advisers had been well organized and instructed during three annual visits of the Chief of the Bureau to Europe, and it was therefore decided to interrupt the European trip for the present year and to send an agent to Japan. Professor Trevor Kincaid, of the University of Washington at Seattle, was chosen on account of his skill as a collector, his comparative proximity to Japan, and the fact that he is personally acquainted with many persons in Japan. He sailed on the 2nd of March, and the results of the expedition have more than justified the expense involved. A very large amount of parasitic material has been received from him in good condition at Boston, and very many parasites from Japan have been colonized in the woodlands of New England.

Still another decided innovation has been the carrying on of active winter work with parasites, especially those secured from imported nests of the brown-tail moth which began to come in from Europe in December. It was found quite possible to breed these parasites in artificially heated rooms, feeding them upon hibernating native brown-tail moth larvæ brought in in their nests from out of doors, feeding the latter upon lettuce and other hothouse foliage and in the early spring securing more normal food for them by sending it up in boxes by mail from Washington and points south. In this way the breeding of the parasites of the genus Pteromalus was carried forward uninterruptedly throughout the winter, and, as during the breeding of successive generations they multiplied exceedingly, it was possible later in the year to liberate a vastly greater number of individuals than would have been possible had the imported species been allowed to hibernate normally in the nests. In the course of this work Mr. W. F. Fiske, in charge of the breeding operations, has invented a rearing tray which has been of the utmost advantage and which will greatly facilitate parasite rearing work in the future.

Still a fifth innovation and one of great value has been the discovery and practice of retarding the development of brown-tail moth eggs by keeping them in cold storage until the arrival of the European egg-parasites which will oviposit upon and breed in these cold storage eggs as freely as those which they attack in the state of nature. This process it has been ascertained may be carried on for a long time, and successive generations of these egg-parasites may be reared from eggs retarded in their development by cold storage. It is thus easy to breed and to liberate an almost infinitely greater number of these egg-parasites, and under favourable conditions, than would be possible from a simple importation of European parasitized eggs which would have to arrive in America at a specific time. These latter innovations have been due to the ingenuity of Mr. Fiske to whom great praise should be given.

In the same way great advance has been made in the rearing of the Tachinid parasites, under the charge of Mr. C. H. T. Townsend who has devised methods and made observations that have greatly added to our knowledge of the biology of these insects and have resulted in the accumulation of a store of information of the greatest practical value not only in the prosecution of the present undertaking but in any problem of parasitic introduction or control that may arise later. Extraordinary and almost revolutionary discoveries have been made in the life histories of certain of these flies, and without this knowledge the greatest success in handling them practically could not have been reached.

Similarly Mr. A. F. Burgess, in charge of the Coleoptera, has succeeded in a very perfect way in rearing and liberating the important European predatory beetle *Calosoma sycophanta,* as well as some other insects of the same family. Altogether during the fiscal year the following material has been imported:

Brown-tail egg-masses, about 26,000.
Hibernating nests of the brown-tail from 50,000 to 60,000.
Larvæ and pupae of the brown-tail, about 178,000.
Gipsy moth egg-masses, 7 boxes, each containing very many masses.
Gipsy moth larvæ and pupæ, about 161,000.
Gipsy moth larvæ from Japan, 8 large boxes containing several thousand larvæ and parasitic cocoons.
Predatory beetles, 2,892.

It will be noticed that only about half as many of the hibernating nests of the brown-tail were imported during this fiscal year as during last, but the smaller number is offset by the larger numbers of larvæ, pupæ and egg-masses, so that the gross amount received is about the same as that of the previous year. The material received from Japan listed above came in before the 1st July, but in all there have been received about 40 boxes, nearly all of large size. From one shipment of the cocoons between forty-thousand and fifty-thousand adults of one of the most important parasites of the genus Glyptapanteles were reared and were liberated directly in the open.

The colonization work has been going on rapidly during the summer of 1908, and of the species colonized the following have been the most numerous:

Pteromalus from the brown-tail moth nests, 114,000.
Trichogramma from the brown-tail moth eggs, 11,600.
Telenomus from brown-tail eggs, 4,560.
Apanteles of the brown-tail, 12,875.
Japanese Glyptapanteles, 45,000.
Meteorus from brown-tail, 1,080.
Pimpla from brown-tail pupæ, 2,051.
Unclassified Tachinids, 4,177.
Named Tachinids, 1,600.
Calosoma sycophanta, adults and larvæ, 978.

Thus making nearly 200,000 of the most active enemies of the gipsy moth and the brown-tail moth liberated under the most favourable conditions during the year.

The result of the colonization work of previous years has not become very evident. It is altogether likely that the species introduced have found conditions favourable to their increase and that at the present time they exist in considerable numbers. The area, however, is so extensive as to make their occurrence in ordinary collections a matter of chance rather than of likelihood. There has been during the past two years a tremendous destruction of the larvæ of both brown-tail moth and gipsy moth from bacterial and fungus diseases. These diseases have appeared in spots, but unfortunately some of these localities were those where colonies of parasites had been established, and in the wholesale destruction of the caterpillars by disease the introduced parasites must have suffered severely. Knowledge has been gained, however, which will make it more easy to select better localities for colonization in the future. Several of the parasites have been found to have established themselves, and notably the predatory beetle, *Calosoma sycophanta*, has been found in numbers. At least seven species have been found under conditions which indicate their establishment.

There have been imported in all 23 species of Hymenopterous parasites, of which 16 are European. 6 are from Japan, and one at least is common to both regions. Eleven of these have been reared from the gipsy moth, six from the brown-tail moth, and six from both insects.

A number of species of secondary parasites have been reared, and have been killed.

Of Dipterous parasites, at least 29 distinct species have been imported, of which nearly all are parasitic upon both gipsy moth and brown-tail moth.

Of Coleoptera, five species have been imported, all of which will feed upon both gipsy moth and brown-tail moth.

This makes a total of 57 beneficial species, enemies of gipsy moth or brown-tail moth or both, that have been brought over in the course of this work.

The outlook is more favourable than at any period during the progress of the work. Success seems an ultimate certainty, but the time at which perfectly obvious results will be apparent is as yet uncertain.

THE STRAWBERRY WEEVIL (*Anthonomus signatus*).

By William Lochhead, Macdonald College, Que.

This insect is reported as having done considerable damage in 1908 in certain localities, particularly Prince Edward County. It is a small brownish weevil about 1-10 inch in length, with a snout about half as long as the body. The specific name *signatus* is given it on account of the dark spot near the middle of each wing cover.

There is probably but one brood a year. The weevils make their appearance about the time of the earliest blooming of the staminate varieties, and continue their depredations for three or four weeks. "The female first deposits an egg in the bud, then punctures or cuts the stem below it so that in a few days it drops to the ground. Within the severed bud the larva hatched from this egg develops and transforms to the pupa and afterwards to the beetle" (Chittenden, Circular 21, U.S. Bureau of Entomology). The larva hatches from the egg in from 4 to 7 days, and feeds on the pollen within the buds. It becomes full grown in less than a month, and transforms to pupa, and to adult within the cavity of the bud. The pupal stage lasts about a week, and the entire cycle lasts about five weeks.

The adult weevil soon makes its way out of the bud, feeds for a few days; then finds a suitable hiding place for the remainder of the year.

Remedial Treatment: (1) As the weevils are always found on flowers that bear pollen, it is advisable in districts where the weevils are injurious to grow mostly pistillate varieties, and only enough of staminate plants to pollinate the pistillate plants.

(2) Chittenden says that covering the bed is nearly a perfect preventive. This covering may be of muslin, and should be in position at least a week before the first blossoming occurs, and left in position until the first berries are picked.

(3) Another remedy is to grow profuse blooming varieties.

(4) Trap crops of very early blooming varieties such as the "Chas. Downing" may be planted. Upon these the weevils collect, and many can be killed by the application of arsenical sprays.

(5) Clean culture may be of considerable value in controlling the weevils—the removal of volunteer plants, and the burning over in early spring of underbrush and weeds.

(6) Certain substances, such as dilute crude carbolic acid (1 part in 100 of water), and Bordeaux, seem to act as repellents, and their application would appear to be of value.

WHAT ENTOMOLOGY THE FARMER AND FRUIT-GROWER SHOULD KNOW.

By William Lochhead, Macdonald College, Que.

This title was suggested to me after reading an address on this topic by Dr. S. A. Forbes, State Entomologist of Illinois. I must also confess to the appropriation of many of the ideas in Dr. Forbes' address, for they represent the matured thought of a distinguished Entomologist of long experience, and one who has done much valuable work along economic lines. The ideas, however, are not new; they have been expressed, perhaps partially, time and again at the meetings of this Society, at Farmers' Institute meetings, and at Fruit Growers' Conventions. They require however to be expressed often, and in all kinds of meetings, to effect a lodgment with the people and to be incorporated into the practical work of the orchard and farm. That, then, is my reason for dealing with this subject at this time.

1. *The farmer and fruit grower should know the principal injurious insects that affect the crops of the farm, orchard and garden.*

As intelligent business men they should be able to identify those agencies that make for losses, and to acquaint themselves with the best up-to-date methods of controlling these agencies. The habit of the insects should be studied, in order that the methods of control may be as effective as possible. Haphazard experimenters are out of place just as much in successful farming as in successful manufacturing. For example, he should know when the Codling Moth of the apple makes its appearance to lay eggs, when the young worms attack the apple, in order that he may apply his poison sprays at the best time to kill them. He should know the life-habits of the white grubs which live two years in the ground as grubs, become pupæ and beetles in the fall of the second year; the beetles not emerging until the following May or June to mate and lay eggs. When infested grass land is broken and the adult beetles are prevented from laying their eggs in that field, he must not expect an entire absence of white grubs, for the young white grubs will continue to feed until their food supply is exhausted. "He will not turn pigs into his grass lands late in fall, to clear them of the grubs, for these bury themselves a foot or two below the surface on the approach of frost."

2. *The farmer and fruit grower should know the injuries done by the principal injurious insects.*

Every crop is attacked at some part at some stage of its existence. For example, the apple tree may be injured in its seedling stage by the leaf-blister-mite on its leaves and the woolly aphis on its roots; the growing tree by borers, plant lice, oyster-shell scale, San Jose scale; and the fruit by the codling worm and the railroad worm. The turnip is attacked by the flea-beetle, during its young stage, and by the turnip aphis and others during its growing period. The corn plant may be injured by the attacks of the seed-corn maggot and wire worm on the seed in the ground, by the white grub and wire worm on its roots, by the cut worm on its stems, by the corn worm on its leaves, and by the grain moths on the stored grain.

The farmer and fruit grower should be able to diagnose the causes of the most serious insect troubles by the nature of the injuries inflicted, as he would diagnose the cause of any ailment of his live stock. It is possible after a careful study of the injuries to plants to identify the particular insects that are causing the injuries, and to deal with them effectively. Sometimes one has to rely entirely on the nature of the injuries for the identification of the insect. Cutworms, for example, work at night and lie concealed in the day time. It is easy to distinguish the work of sucking insects from that of biting insects, but this easy distinction is of prime importance in any rational control of a pest. We sometimes hear of gardeners and fruit-growers using paris green for the control of plant lice. A little elementary knowledge of Entomology on their part would have saved them money, and would have given them success instead of failure.

3. *The farmer and fruit grower should know the characters of the chief orders of insects,* and should be able to recognize the order to which any common injurious form belongs from a glance at the *larva* or *adult*. There are for all practical purposes but seven orders or divisions into which the chief injurious insects may be placed. He should know what orders or groups pass through a *complete* metamorphosis,—from egg to larva, to pupa, to adult,—during their life-history, and what orders have an *incomplete* metamorphosis, *i.e.*, have the young somewhat like the adults; the meaning of the terms *cocoon, chrysalis, larva, pupa*; the difference between a *caterpillar* and a *grub;* between a *grub* and a *maggot;* and of what order each is characteristic; what orders have biting mouth parts, and what orders have sucking mouth parts. All this information is needful and preliminary to an intelligent control of injurious insects.

4. *Every Farmer and Fruit Grower should know the Effect of Crop Rotations, Good Cultivation, etc., i.e., Cultural Methods in Insect Life.*

Cultural methods stand opposed here to *artificial* methods, such as spraying. Where crop rotation is not practised the white grub and wire worms sooner or later take possession of grass lands, and the cultivated lands for a year or two after they are broken. But a good crop rotation, where the crop is changed frequently makes it impossible for any insect to pass through its life-stages without being seriously disturbed and its food supply destroyed. Some rotations are preferable to others when certain insects become injurious. For example, where corn is the chief crop, a rotation of *clover, corn, oats* is better than *forage grasses, corn, oats,* for the reason that many insects which are injurious to hay and grass land are also injurious to corn.

Where a system of short crop rotations has been in use injurious insects such as the wire worm and white grub are seldom troublesome. The setting apart of a field for a number of years in succession to the same crop, be it pasture, hay, oats, wheat, clover or corn, must of necessity be attended with serious loss from insect injury.

Good cultivation involves careful treatment of the soil, the crop, and its products. It means careful attention to the waste products and the waste places which are breeding places for many insects injurious to farm crops. It means the adoption of deep late fall plowing under certain conditions, which practice is one of the best methods of dealing with wire worms, white grubs, cut worms and grass-hoppers. It means high fertility of soil, and good drainage of the land, so that vigorous, healthy plants, capable of resisting the drains of insect attacks are grown instead of poorly nourished ones, which are much more liable to succumb.

The effect of high culture is to make the plants recover quickly from insect attacks. Dr. Forbes says correctly, "The effect of nearly every form of insect injury is virtually a *starvation* effect. If the roots of a plant are eaten away or otherwise injured, the surface for the absorption of food is thus reduced and the plant suffers from starvation as a consequence. If the elaborated sap is withdrawn from its cells and vessels by the beaks of sucking insects, the effect is essentially the same—the plant is starved. If the substance of the leaf is injured or destroyed the process of assimilation is interfered with, and less assimilated food becomes available for maintenance and growth,—again a starvation effect."

The effect of timely plowing and planting in the control of insects is not well enough known by our farmers. Much valuable information on these points is now available. Two or three late fall plowings are efficacious against wire worms and white grubs; early plowing of grass land in August will prevent severe cutworm attacks the following year; late sowing of fall wheat will prevent Hessian Fly injury; and early cutting of the first crop of clover will destroy the first brood of the clover-seed midge, and thus save the clover-seed of the later crop.

5. *Every Farmer and Fruit Grower should know the value of Co-operative measures in dealing with injurious pests.*

The importance of co-operation has been brought vividly to our attention in several cases; *viz.*, the Hessian Fly outbreak a few years ago, the Pea-weevil scourge, the Codling Moth and the San Jose Scale ravages; and the apple maggot injuries in some sections. As a matter of fact, many of our economic problems in Entomology will remain unsolved until a widespread public co-operative sentiment arises in our midst, "Many difficulties which would yield at once to community action are beyond the power of individual remedy."

I have stated briefly five of the main points which I believe every Farmer and Fruit Grower should know. While we realize that but few persons possess this knowledge, are we doing much to hasten the day when all shall have this knowledge? I believe this Society has done much good through its individual members and through the Reports which are published every year. I believe, however, that the most effective work must be done at the agricultural colleges with the young men who assemble there for instruction. Such knowledge as I have indicated cannot be imparted in a few popular lectures. Time is required to give the knowledge of, and and acquaintance with the insects that will be of much practical value to the young farmers when they return to put into actual operation the lessons they have learned in the class-room and laboratory.

I believe the agricultural colleges are giving courses in Entomology along the very lines I have indicated. The courses in Entomology at the O. A. C. and Macdonald College are so arranged that the important elementary economic topics are discussed and studied in the second year by all the students in that year. Practically, then, all students who attend the O. A. C. and Macdonald College are given instruction in this most important aspect of agricultural operation. Unfortunately all students are not missionaries; many fail to proclaim the important entomological tidings to their benighted neighbours, and so the great work of the evangelization of the whole land is delayed. The wide-spread interest in agricultural education for rural schools indicates that some of the seed, at least, that was planted by the older men among us fell on good ground; for the present, interest has, to some extent, developed by way of *Nature Study*.

To one who took an active part in this movement for agricultural education it is clear that the presentation of the various phases of insect life by many of the members of this Society throughout the Province made a deep impression, whereby it was possible to introduce Nature Study into many of our schools.

INJURIOUS INSECTS IN ONTARIO IN 1908.

By C. J. S. Bethune, Ontario Agricultural College, Guelph.

The season of insect activity, which has now come to a close, has not been marked by any unusual outbreak, such as that of the Variegated Cutworm last year, but several of our well known pests have been more than usually destructive to certain kinds of vegetation. The long hot summer, with plenty of rain in this part of the Province till the middle of August, and the subsequent protracted drouth which has lasted with but few slight breaks till the present time (November), has been favourable to the multiplication of many insects while detrimental to others.

Insects Affecting Farm Crops.

Plant-Lice. There have been more complaints this summer concerning the damage done to turnips and cabbages by Plant-lice (Aphids) Fig. 33, than regarding any other kind of insect. From every part of the Province letters have come asking what could be done to get rid of the pest and to save the crop. Usually the application has been too late—the plants have been injured beyond recovery, and no treatment could restore their lost vitality. The warm dry weather in September was very favourable to the increase of this most prolific insect, and they multiplied to enormous numbers before their attack was noticed. They usually congregate on the under side of the leaves and are out of sight to a casual observer, but many of them are on the upper surface as well and the dead and withering leaves should serve to draw attention to them. These plant-lice are dark green in colour, much the same shade as the leaf they are feeding upon, and are covered with a mealy-looking powder of a bluish or ashen hue, which gives them a particularly disgusting appearance. Each of the myriad lice is engaged all day long in sucking the juices of the plant on which it is stationed and the combined effect of so many feeders is soon shewn by the impoverishment and destruction of the leaf.

These sucking insects can be destroyed by the application of any of the usual contact remedies, such as kerosene emulsion, tobacco wash or strong soap-suds; the last is probably the cheapest and easiest remedy to procure and has been found very effective. A difficulty, however, is experienced with all these applications in getting at the insects on the under side of the leaves which are often close to the ground. In order to ward off an attack next year all the refuse of the crop, such as cabbage stalks and turnip leaves, should be destroyed by forming them into a compost heap or some other method which will prevent any lice upon them from finding secure winter quarters, and also kill the eggs which are laid on stems and leaves. This should have been done as soon as the crop was taken off the field. Next year these vegetables should not be planted on the same piece of ground, and should be watched for the first appearance of any colonies of lice. If a sharp look-out is kept during hoeing and any affected plants cut out and crushed under foot, a very great deal will be done to reduce the number of colonies if not to entirely clear out the insect.

Wire-Worms and White Grubs. (Figs. 34 and 35). Next in order to the foregoing were enquiries respecting these two classes of insects, which attack the roots of various plants and destroy large numbers of them. Being underground feeders no method has yet been found of applying a poison for their destruction. A great many experiments have been made in various places and all sorts of things have been tried, but nothing has yet been found to answer the purpose. Salt is often suggested, but it would require so large a quantity to kill the worms that all vegetation would be destroyed as well. Apparently the only thing that can be done is to prevent their breeding and coming to maturity by a short rotation of crops. Both these insects increase and multiply in grass lands, especially old pastures, where the worms and grubs feed upon the roots. If left long undisturbed they become very numerous and destructive. When an infected field of this kind is broken up for the first time, not much damage is done to the crop that is put in as the worms have still plenty of food in the roots and leaves of the grass that has been ploughed under. The next year this supply of food is gone and the worms must attack the roots of the crop whatever it may be or perish of hunger. Hence it is that corn and many other things suffer severely the second season after the grass field has been broken up. The most effective method, so far as the writer knows, is to plough up the infested field in August to destroy the tender pupæ which have been formed by that time and again late in October to expose the newly formed beetles and also the young worms to the cold and frost of winter; this ploughing will also enable birds and other creatures to get at and devour them; poultry and pigs will feed upon them eagerly and should be allowed to range over the field immediately after it is broken up.

Wheat Insects. The Hessian Fly has been present in injurious numbers affecting winter wheat in the Counties of Norfolk, Brant and Essex and in the Niagara District; in other parts of the Province it does not seem to have inflicted any appreciable injury. The plan of sowing wheat after the middle of September in order that the plants may be too late for the egg-laying of the flies has proved satisfactory, though it is attended with the risk in an unfavourable season of having an imperfectly grown plant to withstand the dangers of winter. A useful method is to sow a strip of wheat two or three weeks before the regular crop and thus provide the flies with a suitable place in which to deposit their eggs; later on this should be ploughed under and the insects destroyed, thus leaving the main crop free from injury.

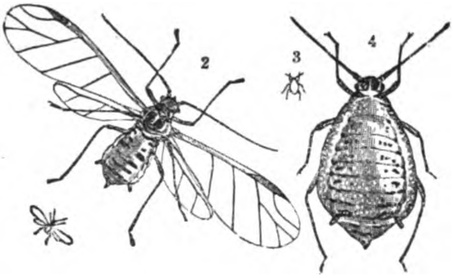

Fig. 33. Cabbage aphis: winged male, wingless female. Small figures are the natural size.

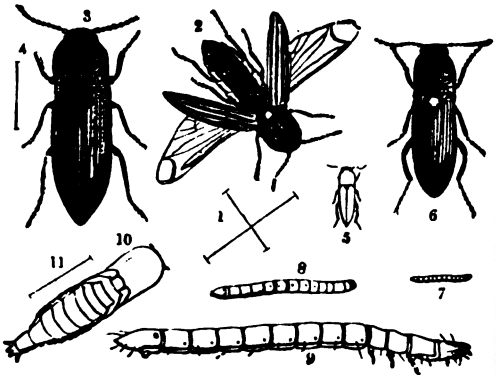

Fig. 34. Wire-worms: beetles and grubs.

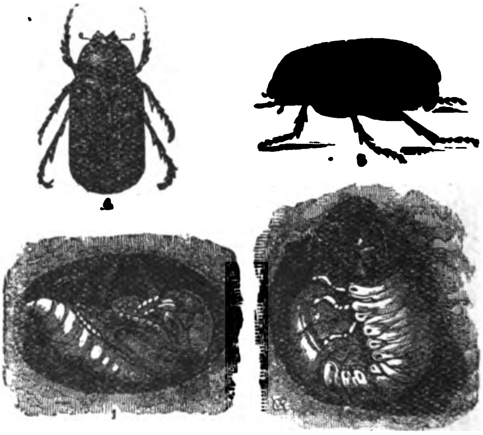

Fig. 35. White grubs; beetles, larva and pupa.

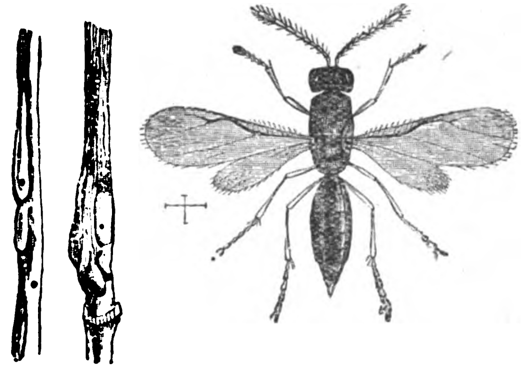

Fig. 36. Wheat joint-worm; affected joints; fly greatly magnified.

The Wheat Joint-worm (*Isosoma tritici*, Fitch), Fig. 36, is not of common occurrence in Ontario. Three years ago Dr. Fletcher reported a somewhat severe outbreak at Millbrook and complaints were made of it in some of the south-western counties. This year specimens of its work have been sent to us from Petrolia only. The parent insect is a minute black four-winged fly, belonging to the same order as Wasps and Ichneumons and to a family most of the members of which are parasitic upon other insects. The eggs are laid at or near a joint of the growing wheat plant, and the larva burrows into the stem and causes a gall-like swelling to be produced inside which it lives and feeds. This swelling becomes hard and renders the straw so brittle above and below it that it is frequently broken off in a storm. The hardened portions which remain when the grain is cut are apt to be separated from the straw and to come through the threshing machine with the grain. When winnowed out these fragments with other refuse should be burnt. Most of the galls, however, are left in the stubble and contain the wintering larvæ; in order to destroy these the field should be burnt over in the fall if practicable, or the stubble deeply ploughed under. Usually a short rotation of crops with clean cultivation serves to keep this insect in check, and thus we do not often hear of any damage being done by it.

Indian Corn Insects. The Greasy Cutworm (*Agrotis ypsilon*) Fig. 37, has severely attacked some fields of corn, cutting off the young plant at the surface of the ground, and also attacking the roots; and the Glassy Cutworm (*Hadena devastatrix*) Fig. 38, caused much damage to several acres of corn near Listowel. Other species have seriously injured turnips and wheat in some localities. These night-feeding caterpillars are half grown in autumn and feed voraciously on almost any kind of vegetation that comes to hand in the spring. Fortunately there is a very satisfactory remedy which can easily be applied; it is called the poisoned Bran-mash. It is made by mixing half a pound of Paris green in fifty pounds of bran, stirring constantly and adding the poison little by little; this is sweetened by the addition of two quarts of cheap molasses previously diluted in about a gallon of warm water; the whole must be thoroughly mixed to such an extent that the bran will crumble through the fingers and not form hard lumps. The mash is distributed through the infested plot by means of a Planet Junior drill or by hand in the evening, taking care that poultry do not get at it. The worms come out at night and devour it in preference to the plants, and usually go off to die either under the surface of the ground or some other convenient hiding place, so that no dead ones are found lying about in the morning. One who tried this remedy with very much doubt as to its value, unearthed quarts of dead cutworms after a night's application and became thoroughly convinced of its effectiveness.

The Pea Moth. (*Semasia nigricana*) Fig. 39, has been troublesome in the neighbourhood of Lindsay. Eggs are laid by the parent moth on the young pods and from these hatch out small caterpillars which make their way inside and devour the peas; when full grown they leave the pods and form a cocoon beneath the surface of the ground and there remain all winter, the moth coming out the following summer. It has been found that early maturing varieties of peas are free from the attack as they are too far advanced when the eggs are laid, it is therefore advisable to sow as early as possible wherever it is known that there is danger of injury from this insect. In gardens the ground should be dug deeply in the fall to bury the cocoons so that the moths cannot reach the surface when they come out, and all immature pods should be burnt when the crop has been picked. In field cultivation deep plowing and the removal of all refuse should be attended to; any infested plot should not be sown with peas again for two or three years. It is not likely that any poison can be successfully applied as the worm buries itself in the pod as soon as it is hatched.

The Pea Weevil. (*Bruchus pisorum*) Fig. 40, is to be found every year in many localities. If growers everywhere adopt the simple method of fumigating with bisulphide of carbon as soon as possible after harvesting there would soon be little injury to complain of; one ounce to one hundred pounds of seed has been found sufficient. All refuse after threshing should be cleaned up and burnt and no weevilly peas should ever be sown.

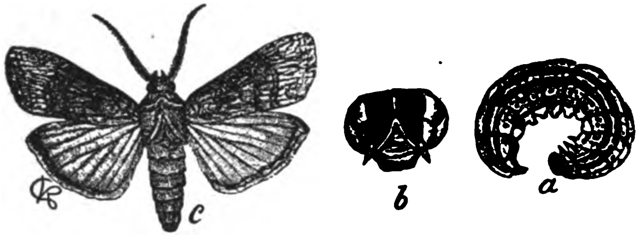

Fig. 37. Greasy Cutworm; (*b*) front of head; (*c*) moth.

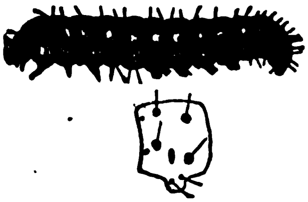

Fig. 38. Glassy Cutworm.

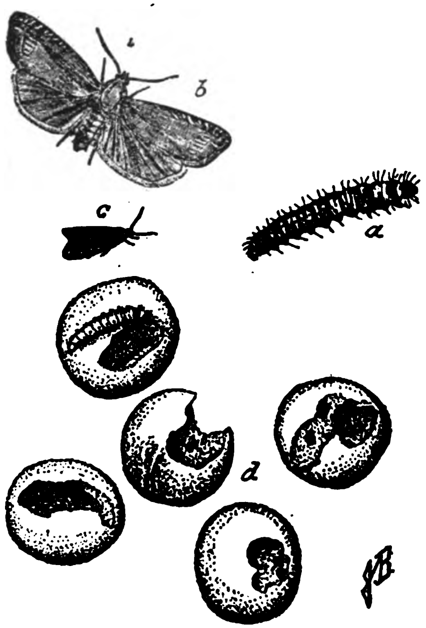

Fig 39. Pea moth, larva and infested peas.

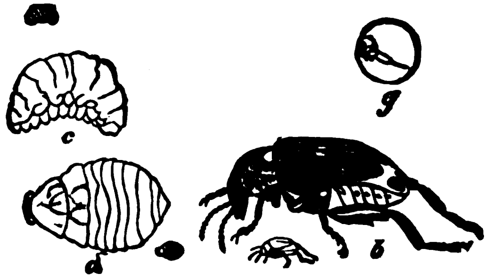

Fig. 40. Pea Weevil.

Clover-Seed Midge. Many complaints have been received respecting loss caused by this insect. The adult is a two-winged fly which lays its eggs in the flower heads of clover; the maggots, when hatched, burrow into the ovaries and feed upon the developing seeds. They become mature at the end of June, descend into the ground and pupate there. A second brood of flies come out when the clover is again in flower and the same course is repeated; in this way both crops are prevented from maturing a large proportion of their seed. The winter is passed by the maggots in the earth; they do not, like the Pea-weevils, remain in the seed or continue their work of destruction. These red larvæ may, howver, be found amongst the seed after threshing, but any that we have seen at that time were dead.

There is a simple remedy which has been found very effective, that is to cut, or feed off, the first crop of clover by the 15th of June, and thus destroy the maggots before they go into the ground to pupate. The result is that they fail to mature and there are no flies to lay eggs for another brood. The second crop will then produce good clean seed, having the further advantage of many more bumble bees in August than there were in June to assist in the process of fertilizing the bloom.

Insects Affecting Fruit-Trees.

In the earlier part of this report there is given an account of the discussion of many of the most serious insect pests of the orchard; it is, therefore, unnecessary to refer to them here, except very briefly. Of the scale insects we have as usual received complaints of the Oyster-shell Bark-louse from all over the province. The San Josè scale is reported from Dresden, a new locality; the Curtis and Scurfy scales have been sent in from Simcoe and from Vineland, and no doubt are to be found in many other places, but they are seldom numerous enough to do any serious damage.

The Pear and Cherry-Tree Slug (*Eriocampa cerasi*) has been very abundant in many places this year; the second brood continuing their injury to the foliage till quite late in the fall. The slimy black or greenish slug-like larvæ can be destroyed by dusting with Paris green or lime, or spraying with white hellebore mixed in water.

Apple-trees in unsprayed orchards in Sandwich, London, Simcoe, Guelph and other places suffered a good deal from the Cigar Case-bearer, the Apple-bud Moth and the Trumpet Leaf-miner. The fruit itself was attacked in many localities apparently by the Snowy Tree-cricket and the Plum Curculio, causing malformations of the apples and a serious impairment of their value; the Tussock Worms were also found attacking the fruit in a similar manner. Not much attention has been paid to injury from these sources; it is important therefore that careful observations should be made both as to the insect causing the injury and the time when it is done, in order that intelligent measures may be adopted for prevention.

Among the small fruits, Strawberry plants have been much damaged by Wire-worms and White-grubs at the roots, especially where they were planted in old pasture fields which had recently been broken up. It is impossible to apply any remedy for the destruction of these underground feeders; the only method of getting rid of them is by a short rotation of crops involving frequent cultivation of the soil and the consequent disturbance of the grubs and pupæ, as stated in the earlier part of this paper. The Strawberry Weevil has caused some damage by cutting off the pollen-bearing blossoms and preventing the setting of the fruit.

The Rose Chafer, which usually appears in swarms about the time that the Grapes are in blossom, has not been so abundant as usual this year, though bad at Cooksville, Niagara Falls, Simcoe and some other places.

Raspberry and Blackberry bushes have been attacked in some localities by the Cane-girdler—a slender beetle, less than half an inch in length, black in colour with an orange or yellow thorax on which are three black dots. The beetle bites a series of small holes close together all round a cane not very far from the tip, and then makes another series about the length of its own body from the first; between these two girdlings it excavates a hole and deposits an orange coloured egg. The grub lives on the pith of the cane, which soon withers and dies above the girdling, and is checked in its growth. All affected canes should be cut off an inch or two below the place attacked and the prunings burnt in order to destroy the grubs within them.

A Leaf-miner (*Scholioneura capitalis*) has been very prevalent this year at St. Catharines, Oakville and in Prince Edward County, injuring the leaves of Blackberry bushes; in some cases a large proportion of the leaves were attacked and became prematurely withered.

INSECTS OF THE VEGETABLE AND FLOWER GARDEN.

There has been no special outbreak during the past season, but many of our familiar pests have been more or less abundant and destructive. The Asparagus beetles, which came to us across the Niagara river and spread westerly and northerly, are now travelling eastward along the shore of Lake Ontario as well; the latest reports have come from Oshawa. Wherever they go they establish permanent colonies and will require to be dealt with every year.

Plant-lice (*Aphids*), as already mentioned, have been unusually abundant this year, and have not only attacked turnips and cabbage, but also lettuce, peas, potatoes, roses, and most other garden plants, a variety of species being present.

Tomatoes have in several places been attacked by the large caterpillars of the Sphinx moth; where these voracious feeders are numerous they devour a large amount of foliage and sometimes strip the plants of their leaves. Being so large and conspicuous they can easily be picked off by hand and crushed under foot. Owing probably to the very hot weather in September a number of moths emerged from the chrysalids that we had in a breeding cage, instead of remaining buried in the ground all winter.

MISCELLANEOUS.

The Mediterranean Flour Moth (*Ephestia Kuhniella*) has made its unwelcome appearance in several mills in this part of Ontario. In one situated in Guelph, an annual fumigation with hydrocyanic acid gas is made with excellent results; it would probably be better, however, to repeat the operation at an interval of a few weeks when another brood may be developed, as it is doubtful whether the gas will kill the eggs of the insect. All sacks and packing material brought from other places should be steamed, or otherwise treated, as the insect is evidently in this way introduced into mills previously free from it.

The Indian-meal Moth (*Plodia interpunctella*) has been found in numbers infesting a mill, and the caterpillars in another place were discovered devouring seed wheat, of which they eat the germs and thus spoil a larger quantity than they actually consume. If a whole building should be infested by them it would be advisable to fumigate with hydrocyanic acid gas, but where they are confined to the grain bins they may be destroyed with bisulphide of carbon.

Grain Weevils (*Calandra granaria* and *oryzæ*) have also been found infesting stored grain. These small snout beetles will continue for years breeding and devouring the grain in the same receptacle if left undisturbed. Bisulphide of carbon may also be used as a remedy for these as well as any other granary insect. One great means of preventing injury from all these insects is cleanliness; all bins and other places where grain is stored should be thoroughly cleaned out at least once a year, and fresh grain should not be brought in till the old has been cleared out. All corners and dark places where flour-dust and other refuse accumulate should be regularly swept out at short intervals and thus leave no undisturbed breeding places for these destructive creatures.

Another insect troublesome in the barn is the Clover-hay Worm (*Asopia costalis*), the caterpillar of a very pretty little moth, which has rich red wings adorned with yellow markings. The caterpillar feeds upon dry clover, both in the stack and the mow, and spoils it for fodder, as cattle will not eat it when badly infested. In this case also cleanliness is most important; no old clover or refuse should be left in the barn when fresh supplies are about to be brought in, and the remains of old clover stacks should be burnt or thoroughly cleaned up before a fresh one is built on the same spot.

During a summer trip to Fort William and Port Arthur it was disheartening to find that the Larch Saw-fly (*Nematus Erichsonii*) had extended its ravages along the north shore of Lake Superior. On the line of railway as far east as Nepigon the tamaracs were noticed to be every where dead or dying; on reaching this latter place an examination was made of a number of trees and all were found to be swarming with the caterpillars of this insect. This region of country was burnt over some twenty-five years ago, and the land is now covered with a vigorous growth of young trees of various kinds twenty and thirty feet in height. Scattered through these, as well as in clumps, are great numbers of larches, all of which seemed to be infested with these worms; in all probability in a year or two there will not be a living one left, thus repeating the devastation that was experienced some years ago in the Eastern Townships of the Province of Quebec. As the insect abounds over hundreds of miles of wild country it is evident that nothing can be done to check its devastating work.

Spruce trees in this part of Ontario continue to be attacked by the Spruce Gall-louse (*Chermes abietis*), which has several times been described in these reports. Young nursery trees and individuals grown for ornament may be treated when the young lice are exposed towards the end of May and of August with a soap and tobacco wash or kerosene emulsion. At Whitby some Spruce trees were defoliated this year by the caterpillars of the Spruce Saw-fly (*Lophyrus abietis*). Spraying with any of the arsenicals, applied as soon as any of the worms are seen, would soon get rid of them.

INJURIOUS INSECTS OF QUEBEC IN 1908.

By William Lochhead, Macdonald College, Que.

The damage done by insects in Quebec in 1908 has not been heavy. The season was exceptionally dry over a large area of the Province, which condition may have influenced the insect life in some way not yet ascertained. Dr. Forbes, of Illinois, says that "a wet season—if not too wet—is a favorable one, and a dry season an unfavorable one," inasmuch as the condition tends to the increase in growth and food-supply to the plant. Most serious insect injuries to growing crops diminish with wet weather and increase with dry. In very wet weather "the sap of the plant may become so dilute, through excessive absorption of water by the roots that it loses its nutritive value, and insects dependent on it are not so well nourished as by the denser sap of a plant growing in a drier soil. They consequently grow less thriftily and multiply less abundantly, and may even diminish rapidly in numbers during a wet season, while if the weather were dry and their food nourishing they would increase steadily at a geometrical ratio. After a year or two or three of drouth the intelligent farmer will be more watchful for the first appearances of insect outbreak than after a series of unusually wet years." The Relation of Weather to Insect Life is still a baffling problem, but the economic importance of a satisfactory solution warrants the spending of much time, money, energy, and ability.

It is just as difficult to get reliable returns concerning insect pests from Quebec as it is from Ontario. Many of our common injurious forms are still known as *worms*, or *bugs*, *vers* or *pucerons*, and there are but few persons who can name even the most common injurious insects.

INSECTS AFFECTING CEREAL CROPS. No reports of the presence of the Hessian Fly or Wheat Midge have been received from any part of Quebec. The wheat grain aphis did considerably damage in certain localities. At Macdonald College the experimental plots were badly infested, but towards the end of the season it became very evident that the parasites were very numerous, and that they were controlling the aphis, but they did not appear soon enough to prevent serious damage.

INSECTS AFFECTING VEGETABLES. The cabbage and turnip aphis was a very common pest in late summer and autumn, but judging from reports which have reached me, no very serious damage has resulted. Mr. Chapais informs me that he has not found the *Cabbage aphis* in eastern Quebec. The *green cabbage worm* has been prevalent over a large part of Quebec, and considerable damage has been done. It is a very common pest in eastern Quebec, but not plentiful. The *Cabbage Root Maggot* can usually be found in most fields of vegetables where cabbage and rape are grown, but for the last two or three years, this pest has not made itself manifest to any extent. In some parts of the Province this insect is unknown, as it occurs only at intervals of many years. The *Squash Bug* (Anasa tristis) is not met with in Quebec. Mr. Chapais reports meeting with it now and again, but he says it never causes much damage. I have not seen any specimens of it at Macdonald College during the last two or three years. The cucumber beetles, however, are very abundant and injurious. In eastern Quebec they are not so abundant as in the western parts. The melon aphis, although present, is not at all injurious, and has not been found by Mr. Chapais east of Quebec. The Colorado potato beetle is keeping up its reputation as being the most abundant and persistent pest we have. In spite of all changes in temperature—hard winters and mild winters, wet summers and dry summers, this pest continues to hold its own. In fact, it seemed as if it required a stronger dose of Paris green to kill it than it did a few years ago.

INSECTS AFFECTING LARGE FRUITS. The Codling Moth is reported as being very abundant at Cowansville and at Chateauguay, Covey Hill, Abbotsford, La Trappe and the lower St. Lawrence; in fact, all the reports received emphasize the abundance of this pest of the apple as doing a great deal of damage. The Apple Maggot was not observed at La Trappe, but was very abundant at Como, just across the Ottawa River, and according to Mr. Reid of Chateauguay, is prevalent at Covey Hill. It is evident that it is not prevalent throughout Quebec, else its presence would have been reported by more of my correspondents. The Plum Curculio, which injures both the apple and the plum was a very bad pest at Chateauguay. Mr. Reid states that it is the worst pest the fruit growers have in his district. Mr. Chapais reports it as abundant along the lower St. Lawrence. It does not seem to affect the apples much at La Trappe, but it is very severe on the plums. The green apple aphis is more or less prevalent in some parts of Quebec, but is not troublesome at Cowansville or in the eastern part of the province. It is very abundant at Chateauguay and La Trappe. The Oyster-shell Bark-louse is also one of our most widespread insects in Quebec, and is reported as being very abundant at Cowansville, but at present it is not injurious at La Trappe to any extent. The Canker-worm is not troublesome. The Fall web-worm is very prevalent throughout the province this present autumn.

INSECTS AFFECTING SMALL FRUITS. The Currant-worm is common everywhere, and is very injurious when left uncontrolled. At the Agricultural Institute, at La Trappe, the insect was successfully controlled by Nico Soap. The Raspberry Cane-borer was reported as doing little or no harm, but has been observed as being abundant on the wild canes.

MITES ON RASPBERRIES. In 1907 the raspberry plantation at Macdonald College was badly infested and injured by mites, which have the habit of clustering on the under surface of the leaves. They were again observed in June, 1908, and spraying operations were begun to determine the effect of various solutions in controlling the pests. These operations were in charge of Mr. J. M. Swaine. Ten plants were selected of about the same degree of infestation. The following substances were used:

Nico-soap	Fair results.
Lime-sulphur (5 oz. lime, 21-23 S, 2) ½ gal H_2O.	Effective but killed leaves.
Lead Arsenate (1 to 10)	Not effective.
Bordeaux	Not effective.
V2 (1-10)	Effective.
Whale Oil Soap, 3 oz., 10 gals.	Fair results.
Tobacco decoction	Fair results.
Kerosene Emulsion (1 to 9)	Most effective.
Water	Effective.

Later, the whole patch, excepting three rows, was sprayed with whale oil soap, tobacco decoction and V2. They all killed the mites, where they were very carefully applied, but on the whole about half of the mites were killed. Tobacco was as effective as any of the substances tried. Probably these mites can be better controlled by winter sprays, and experiments will be conducted this coming winter to test the effectiveness of winter sprays.

THE WHITE MARKED TUSSOCK MOTH. Mr. Swaine reports that the Tussock Moth was not nearly so abundant on the shade trees of Montreal as it was in 1907. Fully 90 per cent. of the larvæ that were collected at random from trees were found infested with parasites. Mr. Swaine bred 16 species of parasites.

INSECTS OF THE EASTERN TOWNSHIPS. According to Mr. Douglas Weir *Grass-hoppers* were the cause of some damage to the grain crops in the Eastern Townships, and the *Potato Flea Beetle* was observed in somewhat greater numbers than usual, assisting the Colorado Beetle in the devastation of the potato crop.

In the orchards the *Tent Caterpillar* and plant lice were perhaps most evident, while in the forests and wood lots a species of *Saw-fly* (Nematus Sp.) defoliated many fine groves of birch (mostly *Betula papyrifera* and *B. populifolia*).

INSECTS OBSERVED AT THE PORT OF MONTREAL. Mr. Merritt Baker, Fruit Division, Ottawa, who is in charge of the inspection of apples at the port of Montreal in connection with the inforcement of the Fruit Marks Act informs me that the three most important insects which he has observed in the course of his inspection are the Codling Moth, the Plum Maggot and the Lesser Apple-Worm. The apples which he examined came mostly from the Lake Ontario District, Ontario. The Lesser Apple Worm (*Enar-*

monia prunivora) is an insect which deserves more attention than it has usually received. It is probable that many of the injuries which have been done by this insect have been attributed to the young codling worms. This insect usually bores just below the skin at the blossom end of the apple, or at the point where two apples are in contact. The effect produced is a sunken area, somewhat irregular in outline, still covered by the dead skin of the apple. Observations show that it rarely bores into the fruit very far; never exceeding half an inch. Mr. Baker states that the injury to the apple may continue after the fruit has been packed in barrels. Dr. Felt, New York State Entomologist, states that it works also upon the domestic variety of plums. In appearance, the lesser Apple Worm resembles somewhat the Codling Worm. It is very probable—although direct experiments have not been conducted to test the effectiveness of the remedy—that this insect can be controlled by the same applications as those adopted against the Codling Moth.

THE APPLE MAGGOT OR RAILROAD WORM (Rhagoletis pomonella) has become one of our most serious apple pests. It does not appear to be widely distributed as yet. It appears locally in several districts, and does not seem to have the faculty of spreading far from that locality. The insect winters over as a little brown oval puparium, either on the surface of the ground or at the bottom of barrels containing apples. The adults emerge very regularly throughout the season, from early July up into September, so that they affect both early and late-maturing apples. The adult is a blackish two-winged fly, a little smaller than a common house fly, and may be recognized by the narrow, white bands on its abdomen, and by the four black bands across its wings. The eggs are deposited under the skin of the apple, and the young maggots hatch within a week and begin burrowing and making channels in the developing apple. It seems as if the maggot does not emerge until the apple is matured; there is therefore great danger that many apples which appear quite free from injury when picked and packed in barrels will show serious injuries when the barrels are opened. There is but one brood each season. As spraying has little or no effect in controlling this insect the best methods of control are the gathering and destroying of the fallen apples, which contain the maggot, and the cultivation of the soil in the orchard, at intervals early in the summer, before 1st July, to destroy the pupæ in the soil.

THE FARMER'S WOOD LOT.

BY REV. THOMAS W. FYLES, D.C.L., LEVIS, P. QUE.

> "How dear to this heart are the scenes of my childhood,
> When fond recollection presents them to view:
> The orchard, the meadow, *the deep tangled wild-wood*,
> And ev'ry loved spot that my infancy knew."

Many a man who, in early life, left his father's homestead to try his fortune far away, has listened to the song of "The Old Oaken Bucket" with keen emotion.

It is the nature of man to

> "look before and after,
> And sigh for what is not."

And, in his leisure moments, when wearied with the turmoil of the busy world, the fancy of the exile from home will often revert to the scenes of his early life.

Among the cherished recollections of such a one will be the Wood Lot, with its stately trees, its pleasant glades, its cool retreats.

He will think of its hazel copses, its blackberry tangles, its furred and feathered denizens, its wealth of flowers.

He can call to mind its appearance in the early summer, when all the trees of the wood rejoice before the Lord, when the delicate green of the young foliage was relieved by the yellow catkins of the birches and the darker hues of the pines.

The glories of its autumnal tints will also present themselves to his fond remembrance—the splendid crimson and gold of its maples, the Indian yellow of its beeches, the rich rosy bronze of its oaks.

It will seem to him as if the woodland were wont to don its richest robes, to bid adieu to summer with befitting state.

Amid such scenes he received his first lessons in wood-craft, and learned to call the trees by their names, and to distinguish each kind by its peculiarities, and to know the timber of each by its grain, and to tell the uses for which it was adapted.

There he learned to admire the inexhaustible resources of the Divine Creator revealed on every hand, and the marvellous—to speak paradoxically—diversity in uniformity under which no two leaves of one tree exactly agree in all points of outline and venation.

Then, it may be his thought will revert to his early companions, and their frolics in the woods and sugar-house. He can recall the names, the features, the characteristics of his early friends; and he may wonder whither their several paths in life have led them.

But dearest to his fond recollection—dear and yet sorrowful—will be the remembrance of the home circle. He will think of his parents now laid to rest, it may be, in a selected spot of their own land; and he will perhaps view, with shame and regret, his conduct in leaving the old folk to carry on the farm, in their declining years, without the aid of his youthful energy and strong right arm.

"It is true," our friend may say to himself, "that the farm was less productive than it had been, that the prices of produce were low, and the general outlook somewhat gloomy; but observation has since taught me, that, as the population has increased, the prices of produce have risen, that new railways have given access to better markets, that such noble institutions as the Ontario Agricultural College at Guelph, and the Macdonald College at Ste. Anne de Bellevue, have made known that more can be done with, and made from, the land than our fathers were aware of. If I could have had the advantage of a training, such as these colleges afford, my ambition would have been aroused, and I would have staid by the land and made it profitable. And what nobler business can a man undertake! The cultivation of the soil was the work appointed for Adam by his Maker. The occupations of the farmer have not unfitted men for high endeavours. Stock-raising was the business of Abraham, the father of the faithful, the friend of God: the prophet Amos was a herdsman; it was from the sheep-fold that God took His servant David away, that he might feed Jacob His people, and Israel His inheritance. It was from the plough that Cincinnatus was called to the Dictatorship; and the poet, Horace, delighted in his Sabine farm."

But, leaving our city man to his cogitations, let us now make some observations on the wood lot for ourselves.

I do not in this article refer to the White Birch allotments that may be seen on the French Canadian farms around Montreal, nor to the Spruce growth on many of our northern farms; though these have their interesting features. I have in mind the mixed growth, remains of the old forest that once covered the land: such as may be seen on the rougher portions of farms, in parts of the Eastern Townships and the New England States.

The *aristocracy*, so to speak, among the trees of such wood-lots are the lordly pine, the sturdy hemlock, the stately yellow birch, and the basswood beloved of bees. These rise, straight and tall, amid the numerous spruces, balsams, tamaracks, elms, maples, beeches, poplars and balm-of-Gileads.

Among all these fine and useful trees are others of smaller growth: thorns, hornbeams, amelanchiers, moosemissies, etc.

Stand with me in such a wood, and see the tall pines, with their spreading layers of foliage rising tier above tier; the graceful balsams, like church-spires pointing heavenward; the vase-like contour of the elms.

Time would fail us to consider the peculiarities and uses of many of the trees—let us observe those of *one* genus, that of *Fraxinus*, the Ash.

Of the six kinds of Ash accredited by Grey to North America, three are found commonly in Canada:

The White Ash, *Fraxinus Americana;*
The Red Ash, *Fraxinus pubescens;*
The Black Ash, *Fraxinus sambucifolia.*

The fruit of each of these is a Samara, or winged seed, and the leaves are compound leaves, and these afford distinguishing features for the three kinds I have mentioned.

In the *White Ash* the stalks of the leaflets are smooth and glabrous.

In the *Red,* they are softly pubescent.

In the *Black,* the leaflets have no stalks—they are sessile.

Again:—

The seed of the *White Ash* is winged from the apex only.

In the *Red,* the seed is edged on either side; and the edges gradually expand into the wing.

In the *Black,* the seed is winged all round.

These seeds hang in clusters. The children in England call them locks and keys.

The White Ash is a valuable shade tree. Its symmetrical stem, its graceful contour, and its elegant foliage render it a favorite for the lawn or park.

Then it is remarkably free from insects. In North America some 500 kinds of insects feed upon the oak; but about 50 only feed upon the ash; and of these very few can be said to be injurious or offensive.

The wood of the White Ash, on account of its toughness, its close grain, and its freedom from flaws, is valuable for the construction of carriages, farm vehicles and implements.

The wood of the Black Ash is useful for other purposes. Bars of it are well soaked, and pounded with mallets. They can then be rent into fine strips for basket work and bottoming of chairs.

Let us now turn our thoughts for a few moments to the sentient things around us.

I dare say you noticed when we entered the wood-lot that a sentinel-crow sounded an alarm—and now a dead silence seems to have fallen on the woodland. Let us sit on this log till the inhabitants of the wood have regained confidence. Meanwhile, I will say a few words about the crows.

The crows build frequently in spruce trees. The dense foliage of these trees hides their nest. I had the curiosity to climb to a nest some years ago; and I was rewarded for my pains, for a strange nest I found it. The builders had stolen a whole length of clothes-line, and with great ingenuity had wound the cord round and round, and between the young branches of the tree, making a very firm basis for their nest.

You all know that the first egg of a pullet is sometimes very small: the mother crow, whose nest I invaded, must have been a yearling bird, for there was in the nest one very diminutive egg, with others of the usual size.

Ah, our patience is meeting with its reward—the birds and animals are no longer silent.

There is an oriole wending its way to its nest that we saw suspended from the extremity of an elm bough on the verge of the wood.

And yonder, near the top of that tall hemlock stump, a Golden-winged Wood-pecker (*Colaptes duratus*) is busy enlarging a hole in which to make its nest. What a litter he is making! "The carpenter is known by his chips." Now he flies away. Observe the graceful curves of his flight, and notice his peculiar call, which suggested the common name by which he is known—"Wake-up."

The stump he was operating upon must be fourteen feet high. Its top shews that *the axe* had severed it from the upper portion of the tree. How did the woodman find standing room for his work? The explanation is this:—the tree was blown down in some fierce gale. It tore from the ground, on all sides but one, a mass of roots, charged heavily with soil and stones, and leaving a deep hollow in the earth. The farmer came; peeled off the bark as far as the branches; cut off the limbs and top; then marked the trunk into lengths. He stept up on the tree, and standing with feet wide apart, chopped off standard logs—one—two—three. As the third log fell, he felt the butt, on which he was standing, beginning to move. He jumped, and so doing, escaped from being shot, as from a catapult, yards away. The counter weight being gone, the heavy mass of roots, with the stump in place, fell back into its matrix with a thud.

See yonder in the maples a pair of grey squirrels. What a frolic they are having! Chasing each other as if they were playing "tag," their long tails extended, or curved gracefully over their backs. Those tails serve them for Winter blankets. The little creatures, in their snug retreats, during the cold weather lie closely curled, and wrapped by their soft tails, heedless of wind and storm. They are sportive enough now—bye-and-bye, when Autumn is well advanced, they will be busy collecting beech nuts, acorns and butter nuts for their Winter supplies.

The butter nuts are truly to the squirrels *Juglans*—Jovis glans—Jupiter's nuts—the provision made by Providence for their Winter's need.

On the other side of us a red squirrel is scolding—"*chuck, chuck.*" I have lost my liking for this little animal ever since I saw one of its kind tearing to pieces the callow young from a young bird's nest that it had discovered.

Yonder runs the prettily striped ground squirrel or "chipmunk." One evening in the first year of my residence in Canada, I walked out from Montreal, where I was then living, to Cote des Neiges. There I encountered half a dozen boys who were greatly excited. Some of them had sticks in their hands; some large stones; all were eagerly searching the stone fences. "What are you hunting?" I asked. "A chipmunk! A chipmunk! !" they shouted. and away they ran. I had never before heard the name. I wondered what ferocious beast was known under the strange appellation.

I was as perplexed as the tourist who came to Quebec to view the Winter scenery. He was a man of more leisure and means than wit. He put up at the St. Louis Hotel, and in the afternoon walked out to the Plains.

He admired the pure unbroken expanse of snow and the fine view over the St. Lawrence and towards St. Jean Chrysostom. Next morning he arose early and took the same course to gain an appetite for breakfast. When lo, he saw some strange tracks in the snow. They were very large, and there was something like the imprint of a spur behind each of them. While he stood greatly puzzled, an old Scotchman drove along on a traineau. Our friend stopped him; and the following colloquy occurred:—

"Can you tell me, Sir, what made these tracks?"

"The snaw-shus."

"What huge tracks! They come from the woods" (pointing towards Wolfe's Field).

"O aye, that' awa."

"They came in the night?"

"Like as not."

"And they go towards the town. Ar'n't the people afraid "

"Na', na'. They're used to them."

And he drove on.

Out came the stranger's note book; and he wrote:—

"The Great Snortshius, a strange creature with huge feet, comes from the woods in the night, and passes into the town; and the people are not terrified. I must enquire further."

So I felt about the chipmunk. I must enquire further; and I did.

The chipmunks and field mice are very mischievous. Towards Spring when their Winter storm of provisions have run short, and when the snow next the earth has melted, leaving run-ways amidst the buried brush, the little animals follow these passages till they come to the young maples, that the farmer has been preserving to form a second growth sugary. They gnaw the bark of the trees near the ground. After a long Winter I have seen scores of young trees completely girdled and destroyed by them. If a young orchard is near the creatures are apt to serve the fruit trees in the same way. Lengths of stove pipe unhooked at the sides, and placed around the base of the trees, and then hooked together again, are a safeguard against the spoilers.

From our seat on the log we can observe many interesting things. Yonder runs a Ruffed Grouse or partridge. It probably has its nest at the foot of some neighbouring tree. The nest is but a slight hollow in a dry spot. The bird lays many eggs. She sits close; and her colour and markings so resemble her surroundings that she is seldom noticed by a passer-by. Her young can run as soon as they are hatched.

I have witnessed a strange device that the partridge has of escaping its foes in the Winter.

I was standing beside a church which was built near such a wood lot as we are considering. The snow lay deep on the ground, and was drifted against the edifice. Suddenly a pair of partridges whirled rapidly round the gable of the building. They were unaware of my presence till they came upon me. I could have touched them but they dived with startling rapidity into the drift beside me, scattering the light snow all around as they passed in, and so completely closing up their passage way that I could not tell the exact spot where they had entered, though it was not more than three yards from me.

Representatives of the insect world are on the wing, or sunning themselves on the foliage. There is *Polygonia faunus*, Edwards, the most beautiful of our Graptadæ. Notice the rich mottling of its under side. There, too, is *Basilarchia arthèmis*, one of the finest of our butterflies. The dark purple of its upper surface is banded with pure white and adorned with orange spots and blue crescents. The larvæ of these lovely butterflies feed upon the elm, willow, etc., and they do little, if any, harm.

But we must not dwell upon the inoffensive insects, however beautiful. Let me draw your attention for a moment to creatures that work in darkness, to the injury of the trees. Some of these belong to the HYMENOPTERA: *Tremex columba*, Drury (Fig. 41); *Uroceros albicornis*, Fabricius; *U. cyaneus*, Fabricius; *U. flavicornis*, Fabricius. They are large, handsome, but formidable looking flies. Their larvæ tunnel in various trees and do much damage. Fortunately their number are kept down by several species of even more dangerous-looking ichneumons: *Thalessa atrata*, Fab.; *T. lunator*, Fab.; *T. nortoni*, Cresson, &c. The larvæ of these follow up the larvæ of the others and devour them. Many a tragedy, that we know not of, is done in the darkness.

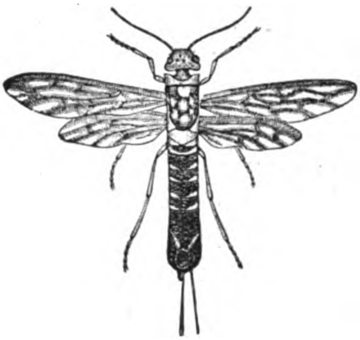

Fig. 41. Pigeon-tremex—the Horn-tail borer—(*Tremex Columba.*)

The larvæ of many beetles are borers. I dare say that this log on which we are sitting is bored through and through by the larvæ of *Orthosoma brunneum*, Forster.

We do not greatly wonder that larvæ of some of the four-winged flies, and of some of the beetles should bore in timber; but it does seem remarkable that larvæ of some of our moths should do the same.

Yet the larvæ of *Cossus centerensis*, Lintner, bore in the Balsam Poplar; the larvæ of *Prionoxystus robiniæ*, Peck, bore in the locust; the larvæ of *Prionoxystus Macmurtrei*, G.-M., bore in the oak; the larvæ of *Ægeria apiformis*, Clerck, bore in the willow; the larvæ of *Sesia acerni*, Clemens, bore in the maple; and there are others of like habits.

Turning our attention to the trees again. There is a White Cedar. Cedar is not plentiful on the Eastern Township farms. The man who owns a cedar swamp owns a mine of wealth for Cedar is of great value for shingles. There are, however, extensive tracts of cedar elsewhere. At Grand Metis, a company, called the "Grand Metis Lumber Company" is operating. This firm cuts, I am told, from 150,000 to 200,000 logs per year, out of which they manufacture from 50,000,000 to 65,000,000 shingles in the same period. They ship their output by rail to the New England States. One thousand feet, log measure, will yield about 8,000 shingles (32 bundles of 250 shingles each).

First quality shingles are worth from $4.00 to $4.35 per thousand, delivered at New England points. The duty at the border is 30 cents per thousand.

Cedar, to the lumber firms, is about twice as remunerative as spruce.

The White Birch is another valuable tree. The spools which are of use all over the world are made from its wood.

There are districts in which the White Birch (or "Bouleau," as the French call it) grows abundantly. Such a tract is that from Matane to Cap Chat, on the south coast of the St. Lawrence.

The firm operating in that part of the country is James Richardson & Co.

The timber is sawn into strips 1½ to 6 feet long; 2 inches broad, 2 inches deep. The white wood only is used; the heart wood is laid aside for fuel.

The strips of white wood are tied up in bundles, and shipped from Matane, in Norwegian sailing vessels, to Coats & Co., of Glasgow, who with some associated companies have the spool business entirely in their own hands.

The vessels that convey the spool wood to Scotland, when taking in cargo at Matane lie half a mile, or more, from the shore; and the lumber is carried out to them in scows, open boats and schooners. 3,000,000 feet of spool-wood board measure is exported from the Matane district every year.

Observe that small tree with blossoms resembling hops. It is the Hop Hornbeam or Iron Wood (*Ostrua virginica*). Young trees of this kind and young ash trees furnish the farmer with levers firm and good.

Speaking of levers, this incident came under my observation some years ago:—A farmer made a "Bee" for the purpose of drawing sawlogs to the mill. The neighbours came. On entering the wood, those who were not already supplied cut levers for themselves. An emigrant, who had been engaged by one of the men, observing this, cut a lever for himself. The work commenced. The emigrant made a great show of strenuous effort—it was but a show. The man beside him called out, "Lift man, lift!" Then he added, "Let me see your pry." Holding this up, he shouted, "A basswood! A basswood!" A roar of contemptuous laughter followed from the other men. The immigrant stood amazed. In his ignorance of the nature of the wood, he did not know that his pretentious ineffectiveness had been exposed.

Even the bushes around us are worthy of attention. There is the Moosewood, also called Wicopy (*Dirca palustris*). You cannot break a stick of it—the rind is too tough; but the wood, when peeled, is remarkably brittle. The farmers, when short of string, use strips of the bark, which is pliant as well as tough, for tying up the mouths of their sacks of grain, etc.

As we make for home, let us consider the condition of things in some parts of the country.

It is grievous to see the way in which farms are often mismanaged. Men with little means and less judgment, buy farms "on time" at more than their value. To meet their payments these men have to part with everything that will bring money. They have not wherewithal to purchase sufficient stock; and they sell the hay off their land year after year, impoverishing the farms more and more. They cut down their woods, and sell the maple for fuel, and the spruce for pulp wood. Where there are chemical works within reach the denudation of the land goes on rapidly, for hard wood is in demand for the distillation of wood alcohol, and other wood for feeding the furnaces in the work. By and bye the farm will be so unproductive that the owner will have to leave it.

According to the latest reports there are in Rhode Island 228 abandoned farms. In Massachusetts the abandoned and waste land amounts to one-tenth the total area of the state. But wealthy and intelligent men are now buying up the abandoned tracts and planting them with trees. One of them this year has planted 63 acres with white pine, and intends to plant 50 acres per year for the next ten years. See the "Richford Gazette" for October 9th, 1908.

Our own people should seize every suitable opportunity for tree-planting. They should put in trees for wind-breaks to their homesteads and orchards, shade trees for their roadsides, ornamental trees for their lawns and parks, young fruit trees to supply gaps in their orchards, young maples to keep up their sugar woods, useful trees in every waste spot.

In conclusion I would impress upon your minds the advice of an old North Countryman:

> " Be aye stickin' in a tree.
> 'Twill be upwards creepin'
> While ye are a-sleepin'.

LIFE HISTORY OF EUCHÆTIAS OREGONENSIS (Stretch).

By Henry H. Lyman, M.A., Montreal.

On 10th July, 1898, I had a day's collecting in High Park on the western outskirts of Toronto.

Neonympha Canthus was abundant in the moist hollows and *Satyrus Nephele* was also flying. *Thecla Edwardsii* and *Lycaena Scudderi* were common, the former on *Ceanothus Americanus* a low spreading shrub with white flowers, and the latter coquetting with the blue flowers of the harebell. *Thecla Acadica* was also flying with *Edwardsii* and *L. Neglecta*, *P. Troilus*, much worn, *P. Nycteis*, *Plusia Simplex*, brown form, were also taken while *L. Arthemis*, *P. Oleracea*, presumably of second brood, were seen, as well as *D. Archippus* from the south leisurely ovipositing.

While collecting the Theclas a white moth came flying around the same plant and was taken. I saw it was a species of Euchætias new to me and as it was a female I kept it alive to secure eggs if possible. I subsequently learned that it was *Oregonensis*, but it had lost all the pale drab tone of the primaries and was practically white.

Eggs, round, gum-drop shape, about as high as the diameter, which is .83 mm., shiny, but showing minute facets under a 2-inch power. Colour, honey-yellow when laid, turning dark lead colour just before hatching.

Began hatching 18th July, and all but one were out on 19th. Egg period about 8 days.

Young larva, length including forked tail 2.33 mm., the forked tail being .17 mm. This forked tail seemed marked under the microscope, but when larva was examined with ordinary pocket magnifier on 21st, after it had fed the forking seemed less conspicuous.

Head, rounded above, brown, darker on upper lobes, the lower part and median suture pale, with a few short hairs. Body after feeding green, yellowish-brown about warts which are dark brown or black. Setæ mostly long, black; cervical shield brown. Wart III. on abdominal segments has two setæ. The setæ on 4th segment are larger than on middle segments and project forward. On 5th segment the upper setæ are nearly twice as long as on middle segments. On 11th to 13th segments they are also longer than on the middle ones, those on 12th and 13th being longer than on the 11th. Feet, dark brown, claspers greenish.

For a wonder the specimen described kept quite still while its description was being taken. The larvæ on hatching were placed on *Asclepias*, but did not fancy it. Mr. Winn suggested Dogbane (*Apocynum Androsæmifolium*) which was then supplied and accepted by the larvæ as satisfactory.

On 22nd July they began passing first moult, the length after the moult being 4.7 mm.

As I was leaving town early in the morning of Saturday, the 23rd to spend Sunday at Lake Memphremagog, I merely took the length expecting to be able to take the rest of the description on my return, but on the 26th recorded in my note book that the second moult had already been passed and made the following description:

Stage III., after second moult. Length 8.6 mm. Head, rather small, rounded above, yellow, the ocelli, brown.

Body, rather plump, greenish yellow, with a green dorsal stripe, more conspicuous on the abdominal segments. Hairs spreading, a few longer than the others on some of the anterior and posterior segments, yellowish. The lateral warts seem to be placed in depressions. Feet and claspers, yellowish.

These larvæ matured very rapidly and on 28th the third moult was being passed.

Stage IV., after third moult. Length before feeding about the same as when last taken.

Head, yellow, mouth parts brownish. Body greenish yellow, the pulsating vessicle showing as a green line. Hairs, long and silky, overhanging the head and anal extremity, light yellowish. Anal claspers, rather small and spreading. Feet and claspers, pale yellowish.

The caterpillar under observation which had just passed the moult stood on its central abdominal claspers and raised both extremities, back to back, brushing them together to adjust the hairs. This it did repeatedly and with so much energy that it lost its hold and fell off the leaf.

On 31st July all but two had passed the fourth moult.

Stage V., after fourth moult. Length, 12.5 to 14 mm. Head, yellow, with tinge of orange, ocelli dark brown or black. Except when feeding or in motion the head is concealed by the hairs of the second and third segments which overhang it. Body, pale greenish, the spreading hairs greenish yellow. There are a number of long hairs on the segment projecting forward over the head, and a few on the third and fourth segments which stand straight up or project slightly forward. These hairs are from three to four times as long as the other hairs. There are also a number of similar long hairs on the 11th, 12th and 13th segments which slope towards the rear.

While I was describing these, at least about a half of them roused themselves and began running about, especially around the rim of the jar, stopping every few seconds and sounding with their feet, raising the thoracic segments and striking a number of times and then going on again. They sometimes crawled part way down the outside of the jar, but generally crawled up again, not showing any disposition to go far from home. Two, however, crawled down to the table, but one of these crawled upon the tin cover of the jar and rested there.

On 1st August two were found to have passed the fifth moult, but no change in size was apparent.

As I was leaving that evening for a brief trip to Tadousac on the lower St. Lawrence I had no time to make any detailed description of Stage VI.

On 5th August the larvæ were passing the sixth and last moult and changing their appearance considerably, but also showing a good deal of variation. Some were mouse-gray all but the head which was still honey-yellow, while others were gray as to the skin, but with yellowish hairs and some had yellowish hairs with a few mouse-gray ones mixed in.

These larvæ were perfectly healthy up to the time of my leaving Tadousac for home on the evening of 7th August. They had been perfectly easy to rear, developed rapidly and none had been lost, but I doubtless made the mistake of not separating them sufficiently as they approached maturity for on my arrival home on the morning of 9th August I found that a choleraic disease had broken out among them and several were dead. I immediately separated them into a number of jars which I had washed with a disinfecting solution of permanganate of potash, putting those that seemed quite healthy by themselves and those under suspicion by themselves.

On 12th August one of those under suspicion spun a rather flimsy gray cocoon weaving in the hairs of its body, but by 21st August all the others had died in spite of all the care that was lavished upon them. Afterwards I found that the one which had spun its cocoon had not had sufficient vitality to pupate.

I thus succeeded in working out the life history of the species, though my cabinet was not enriched with any bred specimens.

Diameter of larval faces of the first six stages were .41, .58, .80, 1.12, 1.38, 1.67 mm.

DR. JAMES FLETCHER.

It is with the most profound regret that we record the death of our very dear friend, Dr. James Fletcher, which occurred on Sunday morning, November 8th. For the last two years his health had not been entirely satisfactory and for more than a twelve month he had been troubled more or less with an internal hemorrhage which caused him much inconvenience and discomfort at times, but which he did not regard as particularly serious. His cheery habit of mind caused him to treat lightly symptoms which would in most cases have excited much alarm. In the middle of September he went out to British Columbia on his annual visit and was absent from home for about six weeks. On his return his colleagues noticed that he had not benefited as much as usual by the trip, and that his appearance was by no means robust. But with characteristic energy he at once set to work to make the arrangements for the Annual Meeting of the Entomological Society of Canada, which he desired should be one of the most successful in its history. As President for the second year in succession, he expected to retire from office, but fully counted upon being present at Guelph and occupying the chair at the various sessions which were held on November the 5th and 6th. During the preceding week, however, he wrote saying that he was going to Montreal to consult a specialist, and might after all be unable to attend. He went down on Saturday the 31st of October, and was at once sent to the Royal Victoria Hospital, there to prepare for an operation. To the writer he sent a letter the following day expressing his great disappointment at being laid up and prevented from coming to Guelph, but full of confidence in the wonderful power of modern surgery and with apparently no fears as to the result. The operation took place on the following Saturday, but he failed, owing to his weak condition, to rally from it and the next morning he died. The operation revealed that he had been suffering for some time from a malignant tumour which had sapped his vitality and would very soon in any case have brought his life to a close. Up to the end he was cheerful and uncomplaining, free from despondency or anxiety about himself, and full of the happy optimism which had always been one of his charming characteristics.

Few men ever made so many loving friends in all walks of life; every one who came to know him could not fail to become warmly attached to him. There are many sad hearts grieving at his loss all over the Dominion of Canada and many, too, in widely scattered places in the United States. Old and young, rich and poor, learned or ignorant, children and their elders, it made no difference—he had a kindly word for each one and most can treasure in their memories a kindly deed as well. When he addressed a meeting he captivated his audience at once and when he joined an excursion of nature students all were eager to be with him, and learn from him some of the secrets of the woods and fields that he knew so well. We shall not see his like again, but we may all feel that it was good for us to have known him—his memory will long live in our hearts—his noble words and generous deeds will be happy recollections for many a year to come.

Dr. James Fletcher was born at Ashe in the County of Kent, England, on March 28th, 1852. He was educated at King's School, Rochester, and came to Canada in 1874 to fill the position of a clerk in the Bank of British North America. Finding the work uncongenial after two years, he gave it up and became an assistant in the Library of Parliament at Ottawa. All his spare time he devoted to Botany and Entomology and became as years went on a recognized authority in each of thse branches of natural science. This led to his appointment as honorary Dominion Entomologist and Botanist and a year or two later to his taking up the work of these departments at the newly established experimental farm. This was in 1887 and for twenty-one years he has been a highly valued assistant to Dr. Saunders, the director, and long since became known throughout North America as one of the ablest scientific men of the day in his special departments.

In 1878 he became a member of the Council of the Entomological Society of Ontario, and every year since he has been elected to hold some office in it, being four times Vice-President, and President for three years, from 1886 to 1888 and again from 1906 to the time of his death, when he had just been re-elected for another year. His first contribution to the Society's publications was an article on Canadian Buprestidæ, which was published in the Annual Report for 1878, and his first contribution to "The Canadian Entomologist" appeared in January, 1880. During all the years that have followed no volume of either publication has been issued without some valuable articles from his pen.

In 1879 he was one of the originators of the Ottawa Field Naturalists' Club, the most successful society of the kind in the Dominion, and more recently he suggested, and by his energy and influence accomplished, the formation of the important Association of Economic Entomologists of North America, of which he was elected President in 1892. He was also one of the original Fellows of the recently formed Entomological Society of America, and was First Vice-President last year. In 1886 he became a Fellow of the Linnæan Society, of London, and in 1896 he received the degree of LL.D., *Honoris causa*, from Queen's University.

In 1885 he was elected a Fellow of the Royal Society of Canada; in 1895 he became President of Section IV., which is devoted to Geological and Biological Sciences. For many years he was Honorary Treasurer of the Society, and for the last two years Honorary Secretary. To the transactions of the Royal Society he contributed the following papers: Presidential Address, 1895, on Practical Entomology; Recent Additions to the list of Injurious Insects of Canada, 1899; The Value of Nature Study in Education, 1901; Descriptions of some new Species and Varieties of Canadian Butterflies, 1903; Notes on the Preparatory Stages of some Species of Canadian Lepidoptera, 1907.

A list of his contributions to scientific and agricultural journals would occupy many pages, if such a list could be completely carried out. His most valuable publications were his annual reports on the work of his department at the Central Experimental Farm and the Bulletins in connection with it, in which he gave accurate detailed descriptions of a large number of injurious insects, and also his papers in the Annual Reports to the Legislature of the Entomological Society of Ontario. Two years ago he completed an admirable work on the Farm Weeds of Canada, containing descriptions of all the most important weeds that are a trouble to agriculturists throughout the Dominion; a handsome quarto volume illustrated with 56 beautiful coloured plates.

Not only with his pen, however, did he perform useful work, but with his voice as well. He was in great demand as a public speaker at Agricultural, Horticultural, and Fruit-growers' conventions, meetings of Farmers' Institutes and other gatherings. On these occasions he at once secured the attention of his audience and charmed them with his graceful language and lively humour. No one else, indeed, has done so much for Canada in instructing the people in a practical knowledge of their worst insect foes and the best methods of dealing with them. His work has thus been of vast importance not only to those directly interested in the products of the soil, but indirectly to all the dwellers within the domains of this wide Dominion.

Though so fully occupied with scientific work he yet found time for other things. He was one of the most efficient members of St. Luke's Hospital board; for many years lay-reader and superintendent of the Sunday school in Holy Trinity Church, Archville, a suburb of Ottawa; and an active member of the St. Andrew's Brotherhood. His religious life as a devout son of the Church of England was known perhaps to but few amongst his intimate friends, though manifested in many ways through his goodness of heart; he lived and died an earnest, God-fearing man, devout and upright, filled with unobtrusive piety, a sincere Christian indeed "in whom was no guile."

While we deplore the loss that we all feel we have individually sustained, we desire to express to his sorrowing family, Mrs. Fletcher and her two daughters, the deepest sympathy with them in their sad bereavement. To them the loss is beyond all words, but it may afford them a ray of comfort to know that he whom now they mourn was so widely beloved, admired and respected and that so many friends share in their grief and are filled with sorrow for him who is gone.

C. J. S. Bethune.

Dr. L. O. Howard, Chief of the Bureau of Entomology in the Department of Agriculture at Washington, a friend of many years standing, writes as follows:

"Dr. Fletcher's services to his country were very great. He had a wonderful grasp of a very broad field in Entomology, and was one of the best-informed men of his time on the intricate and manifold aspects of economic Entomology. His reports were sound and practical, and as a public speaker before assemblages of agriculturists and horticulturists he was unexcelled. His address years ago before the National Geographic Society in Washington, on the Canadian Northwest, was one of the most perfect lectures I ever heard. He was known, admired and loved all through the States. In fact, I have never known a man who had so many absolutely devoted friends as Dr. Fletcher. His energy, his enthusiasm, his absorbing interest in everything that lives and grows, his warm heart, his cheeriness, his perfect lack of even a suspicion of egotism, attracted every one who knew him, and bound them to him in friendship, and even love, forever. Here in Washington among the Entomologists and others there are many sad hearts to-day."

DR. WILLIAM H. ASHMEAD.

On the 17th of October Dr. William Ashmead died in Washington, D.C., aged 53 years. For more than a year he was in such an unsatisfactory state of health that his recovery appeared impossible and it was therefore no surprise to learn that the end had at last arrived. His break down in the midst of a career of scientific usefulness was evidently brought about by overwork; he devoted himself with such intensity to the study of the Hymenoptera and the publication of the results that he gave himself no rest and literally wore himself out, to the grief and distress of his family and many friends.

For close upon thirty years he was a constant contributor to the pages of "The Canadian Entomologist," his first articles on insects affecting the orange, having appeared in 1879. At that time he lived in Jacksonville, Florida, where he was engaged in the publishing business, which included the issue of a daily paper and a weekly agricultural journal. He was naturally much interested in the production of oranges and his attention thus became drawn to the insects injuring the trees and fruit and those parasitic forms that somewhat keep them in check. His work was so thorough that he was made a field Entomologist for the United States Department of Agriculture in 1887, and began his career as a professional Entomologist.

In 1890 he went to Germany and studied for some time in Berlin, thus becoming qualified for the performance of scientific work of a high character. In July, 1897, he was appointed a Curator of the Department of Insects in the United States National Museum at Washington, and continued to hold the position till incapacitated by illness.

In October, 1904, he was elected an "Honorary Member of the Entomological Society of Ontario in recognition of his eminence in the science and the valuable contributions that he so constantly made to the pages of the "Canadian Entomologist." His studies were devoted to the Hymenoptera, and he published many systematic papers on various super-families in the order and described a large number of genera and species. His work was of such a high character that it is regarded as authoritative and has attracted the attention of the leading Entomologist of both Europe and America. One of his completed works is his Monograph of the Proctotrypidæ, a volume of nearly 500 pages published in 1893. Most of his papers are to be found in the Transactions of the American Entomological Society of Philadelphia and in the Canadian Entomologist.

He received the honourary degree of Doctor of Science from the Western University of Pennsylvania and was the recipient of many distinctions from various Entomological Societies. Personally he was esteemed and beloved by all who knew him and there are many who now deplore his loss.

C. J. S. B.

INDEX.

PAGE.
Alder, galls affecting 76
Amblyscirtes samoset 63
American Tent Caterpillar 116
Aphelinus fuscipennis 55
“ mytilaspidis 55
Aphids, injuries from 119
“ the Cabbage and Turnip...21, 128
Apple, galls affecting 89
“ Leaf-hopper 119
“ Maggot 17, 19, 138
“ Worm, the Lesser 16
Araneida, Record of captures 116
Archips fervidana 116
Ash Bark-beetle 25
“ Galls affecting 76
Ashmead, Dr. W. H., the late...... 150
Aspidiotus abietis 52
“ perniciosus 30, 53

Bag-worm 22
Balkwill, J. A., death of 34
Balsam Bark-borer 26
Banks, N., Neuropteroid insects determined 115
Banks' Catalogue of Neuropteroid Insects 100
Bark Borers 19, 20, 24, 25, 26
Barley, Gall affecting 77
Basswood, Galls affecting 77, 117
Bearberry, Gall affecting 77
Beech, Galls affecting 77
Beetle haunts 56
Bethune, C. J. S., articles by...... 128, 147, 150
Bethune's Bibliography of Canadian Entomology 100
Birch, Galls affecting 77
Blue Flag, Gall affecting 78
Boneset, Gall affecting 78
Bradley's Evaniidæ 100
Bramble, Galls affecting 78
Brown-tail Moth 28
“ importation of Parasites 121
Bugle-weed, Gall affecting 78
Busck's Revision of Oecophoridæ.. 100
Butternut, Galls affecting 84
Buttonbush, Gall affecting 79

Cabbage Aphids 21, 128
“ Butterfly, the White 120
Calosoma sycophanta, importation 123
Caudell's Notes on Western Orthoptera 100
Cecidomyiidæ, injuries caused by. 43
Cherry, Galls affecting 88
Chestnut, Gall affecting 79
Chilocorus bivulnerus 54
Chionaspis furfurus 30
“ pinifoliæ 54
Chrysomphalus aonidum 52, 53
Chrysopa larvæ devouring Scale insects 54
Cigar Case-bearer 29
Cinquefoil, Galls affecting 79
Clothes Moths 120
Clover-hay worm 135
Clover-seed Midge 132

PAGE.
Coccidæ of Ontario 52
“ some enemies of 54
Coccinellidæ, usefulness of.......... 54
Coccophagus lecanii 55
Codling Moth 120
Coleoptera, Record of captures...... 107
Coleophora Fletcherella 29
Collectors of Insects, list of......... 102
Comys fusca 55
“ scutellata 55
Cordyceps clavulata 56
Cosmopepla carnifex 11
Cottony Maple-scale, enemies of... 54
Currant, Gall affecting 79
Cutworms 119, 131

Dandelion, Gall affecting 79
Diptera, Record of captures 109
Dogwood, Galls affecting 79

Eastham, A., article by 54
Elm, Galls affecting 79
Elm-leaf Beetle 27
Empoasca mali 119
Enarmonia prunivora 16
Ennomos subsignarius 27, 118
Entomological literature 100
“ Record 99
Eriophyes abnormis 117
“ pyri 15, 29
“ quadripes 117
Eulecanium caryæ 53, 56
“ cerasifex 54, 55
“ Fletcheri 53, 55
Evans, J. D., articles by..............65, 66
Evergreens, Galls affecting 80

Fall Webworm 118
Felt, E. P., articles by 23, 43
Fernald's Genera of Tortricidæ.... 100
Fletcher, James, article by............ 99
Fletcher, James, memorial of the late 147
Franklin, H. J., leterminations of Bombi 111
Fruit Malformations due to insects 18, 133
Fruit-trees, insects affecting.15, 133, 136
Fungus diseases of Coccidæ.......... 56
Fyles, T. W., article by 138

Gall Insects of Ontario 70
Gall Midges, importance of 43
Gall Mites 70
Galls, types of Phytoptid 71
Galls, writers on 93
Gibson, A., articles by......41, 49, 99, 116
Ginseng, Gall affecting 80
Goldenrod, Galls affecting............ 81
Gooseberry, Galls affecting........... 81
Grain weevils 134
Grant, C. E., article by 10
Grape, Galls affecting 81
Gypsy Moth 27
“ importation of Parasites 121

Hackberry, Galls affecting 82
Hahn, Paul, article by 13
Harrington's Hymenoptera of Ottawa 100

Page.
Hawthorn, Galls affecting 82
Hazel, Galls affecting 83
Helianthus, Galls affecting 83
Hemiptera, Records of captures... 112
Hessian Fly 117, 129
Hickory Bark-borer 24
" Galls affecting 83
Hippodamia 13-punctata 54
Horse-balm, Gall affecting 84
House-flies carriers of disease.... 30
Howard, L. O., articles by....121, 149
Huckleberry, Gall affecting 84
Hymenoptera, Record of captures 111
Hyperaspis signatus 54
Indian Corn Insects 131
Indian Meal Moth 134
Insect pests of the season.15, 116, 128, 135
Ischinaspis longirostris 52, 53
Isosoma tritici 130
Jarvis, T. D., articles by 52, 66, 70
Juneberry, Galls affecting 84
Kearfott's N. American Crambid Moths 101
Kermes galliformis 52
" pubescens 56
Lachnosternas, occurrence of 66
Lantern-trap, collecting with 65
Larch Saw-fly 135
Leaf Blister Mite 15, 29
Lepidoptera Heterocera, captures of 104
Lepidoptera Rhopalocera, captures of 103
Lesser Apple-worm 16
Lettuce, Galls affecting 91, 92
Linden Moth, the Snow-white.... 27
Lochhead, W., articles by.31, 124, 125, 135
Locust, Galls affecting 85
Lyman, H. H., article by 145
Maple, Galls affecting 85
Maple-tree borer 27
Mediterranean Flour-Moth 134
Mer Bleue, captures at 117
Microcera coccophila 56
Mites, apparatus for collecting.... 68
Mites on Raspberries 137
Monohammus beetles 25, 60, 61
Morris, F. J. A., article by 56
Mosquito Life: Mitchell 101
Mosquitoes of Saskatchewan: Knab 101
Muhlenbergia, Galls affecting 85
Nash, C. W., article by 11
Neuropteroid insects, captures of. 115
New Jersey Tea, Galls affecting.... 85
Oak, Galls affecting 85
Orthoptera, Record of captures... 113
Osburn's British Columbia Syrphidæ 101
Oyster-shell Scale 30, 54
Parasites, apparatus for procuring 74
Parasites of Gypsy and Brown-tail Moths, importation of 121
Parasites of Scale insects 54
Pea Aphis, the Destructive 119
Pea Moth 131

Page.
Pea Weevil 132
Pear-tree Slug 120
Pear, Galls affecting 89
Peridroma saucia 119
Plum Curculio 136
Plum, Galls affecting 88
Poplar, Galls affecting 87
Prunus fruits, Galls affecting.... 88
Pyrus fruits, Galls affecting 89
Radish Maggot 116
Raspberries, Mites on 137
Raspberry Cane-girdler 133
Red Cedar Bark-beetle 24
Rhagoletis pomonella 17, 138
Rose, Galls affecting 89
Saissetia hemisphæricum 52
San Jose Scale 30
" " in Ontario (map).... 53
Scale Insects 30, 52
" enemies of 54
Scolytus quadrispinosus 24
" rugulosus 19, 20, 24
Scurfy Scale 30
Shot-hole Borer 19, 20, 24
Smith's notes on Species of Amathes 101
Smith's Revision of genus Homoptera 101
Sorghum Midge 43, 47
Sparganothis flavibasana 117
Spiræa, Galls affecting 90
Spruce trees, insects affecting.... 135
Stalk-borers 12, 49
Strawberry, Galls affecting 90
Strawberry Weevil 124
Sumac, Galls affecting 90
Terias lisa 63
Tomicus balsameus 26
" calligraphus 25
" pini 26
Touch-me-not, Galls affecting.... 90
Treherne, R. C., article by.... 47
Tulip tree, Galls affecting 90
Turnip Flea-beetle 116
Turnip lice 21, 128
Tussock-Moth, White marked 13, 26
Van Duzee, E. P., Hemiptera determined 112
Van Duzee's N. American Membracidæ 102
Vegetables, insects affecting 134, 136
Vervain, galls affecting 90
Viburnum, Galls affecting 91
Virginia Creeper, galls affecting.... 91
Walker, E. M., Odonata determined 114
Walker, E. M., Orthoptera determined 113
Walnut, Galls affecting 84
Wheat insects 129
" Joint-worm 130
White Grubs 129
Williams, J. B., article by 10
Willow, Galls affecting 91
Winn, A. F., article by 63
Wire-worms 129
Witch Hazel, Galls affecting 92
Wood Nettle, Galls affecting 92

JAN 4 1912

Fortieth Annual Report

OF THE

Entomological Society

OF ONTARIO

1909

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To the Honourable JOHN MORISON GIBSON, K.C., LL.D., etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present herewith for the consideration of your Honour the Report of the Entomological Society of Ontario for 1909.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1910.

CONTENTS.

PAGE.

LETTER OF TRANSMISSION 5

OFFICERS FOR 1909-1910 6

CANADIAN MEMBERS 7

ANNUAL MEETING 9

Reports on Insects of the Year: Division No. 1, ARTHUR GIBSON 9

Division No. 3, J. B. WILLIAMS 14

Division No. 4, C. W. NASH 15

Observations on a few Insects of the Season: L. CAESAR 16

Nests of the Brown-tail Moth on Imported Nursery Stock: ARTHUR GIBSON 19

The Larch Saw Fly: C. GORDON HEWITT 20

Nursery Work in Ontario: R. C. TREHERNE 21

Some Guests at the Banquet of Blossoms: F. J. A. MORRIS 23

House Flies and their Allies: C. GORDON HEWITT 30

Report of the Council 36

" " Montreal Branch 39

" " Toronto Branch 40

" " Treasurer 41

" " Curator 41

" " Librarian 42

" " Delegate to the Royal Society of Canada 42

Address of the President: TENNYSON D. JARVIS 44

The Origin and Diffusion of Entomological Errors: HENRY H. LYMAN 46

Conflicts between Ants: G. E. SANDERS 51

The Spruce Bud-worm: ARTHUR GIBSON 54

The Snow-white Linden Moth: A. F. WINN 56

Notes on Fruit-tree Scolytids: J. M. SWAINE 58

Observations on Ontario Insects in 1909: C. J. S. BETHUNE 63

Injurious Insects of Quebec in 1909: W. LOCHHEAD 67

Anisota virginiensis: T. W. FYLES 73

Adaptations in the Structure of Insects: T. W. FYLES 76

The Acarina, with a Host Index to the Species found in Ontario: T. D. JARVIS.. 82

The Entomological Record, 1909: ARTHUR GIBSON 110

In Memoriam, Dr. Wm. Brodie: FRANK MORRIS 129

Index 131

FORTIETH ANNUAL REPORT

OF THE

Entomological Society of Ontario

1909.

To the Honourable James S. Duff, Minister of Agriculture.

SIR,—I have the honour to present herewith the Fortieth Annual Report of the Entomological Society of Ontario, which contains the proceedings of the forty-sixth annual meeting of the Society, which was held at the Agricultural College, Guelph, on the 4th and 5th November, 1909. The report includes the papers read and the reports submitted by the various officers and branches of the Society.

"The Canadian Entomologist," the monthly organ of the Society, has been regularly issued during the past year, and has now completed its forty-first volume, which has maintained the high scientific standard of its long series of predecessors.

I have the honour to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,

Editor.

Ontario Agricultural College,
Guelph.

Entomological Society of Ontario.

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Entomological Society of Ontario.

ANNUAL MEETING.

The forty-sixth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 4th and 5th. During the day meetings the chair was taken by the President, Mr. Tennyson D. Jarvis, and at the evening session by Dr. Bethune. Amongst those present were Messrs. H. H. Lyman and A. F. Winn, Montreal; Dr. C. G. Hewitt and Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. John D. Evans, Trenton; Mr. F. J. A. Morris, Trinity College School, Port Hope; Dr. E. M. Walker and Messrs. C. W. Nash and J. B. Williams, Toronto; Mr. R. C. Treherne, Grimsby; President Creelman, Profs. C. A. Zavitz, R. Harcourt, S. B. McCready, C. J. S. Bethune, Messrs. Jarvis, Howitt, Caesar, Eastham, Crow, Klinck, of the staff, and a large number of the students of the Ontario Agricultural College and the Macdonald Institute, Guelph.

Letters expressing regret at their inability to attend were received from Prof. C. C. James, Deputy Minister of Agriculture for Ontario; Dr. William Saunders, Director of the Dominion Experimental Farms, Ottawa; Rev. Dr. Fyles, Hull, P.Q.; Messrs. Paul Hahn and A. Cosens, Toronto; G. Chagnon, Montreal; C. E. Grant, Orillia; W. E. Saunders and J F. Calvert, London; R. S. Hamilton, Galt; Prof. W. Lochead and Mr. J. M. Swaine, Macdonald College, P.Q., and others.

A business meeting of the Council was held in the Biological Building, at which their report was drawn up and various matters discussed. On motion it was decided to contribute the sum of fifty dollars to the fund for the erection of a memorial drinking fountain to the late Dr. James Fletcher at the Experimental Farm, Ottawa.

In the afternoon the Society met at 2 o'clock in the Biological Lecture room, where there was a goodly attendance of members and students. The first order of proceedings was the reading of the reports of the Directors on the noteworthy insects of the year in their respective districts. Owing to various circumstances, none were received from Mr. C. E. Grant, of Orillia, representing Division No. 2, nor from Mr. R. S. Hamilton, Galt, of Division No. 6.

REPORTS ON INSECTS OF THE YEAR.

DIVISION NO. 1.—OTTAWA DISTRICT. BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

The season of 1909 in the Ottawa District, although cool and late in spring, was an excellent one for growth of all kinds. The rainfall during the whole season was rather above normal, and there was, comparatively speaking, but little hot weather, and this not until the middle of August. Injurious insects, as a whole, were not so troublesome as they were in 1908.

The following notes probably cover those insects which were most complained of in the District during the past season.

ATTACKING FIELD CROPS.

The Hessian Fly (*Mayetiola destructor,* Say.) which was troublesome near Ottawa in 1908, was not reported as present in 1909. On the Central Experimental Farm, where it occurred last year, no trace of its work could be detected this year.

Grasshoppers were decidedly destructive in many localities near Ottawa, particularly in places where the soil is light. On June 21st I received a report that these insects were causing much anxiety to farmers near Buckingham, Que., about 23 miles from Ottawa. It was stated that they were present in that district in "countless millions." Up the Gatineau River grasshoppers were enormously abundant, and many complaints were made concerning their ravages. On July 29th I drove from Maniwaki to Baskatong, Quc., a distance of about 40 miles, and saw the insects in great swarms. Oats, which are largely grown in the Gatineau country, were much damaged, also timothy; the crops in some fields being entirely eaten. At Baskatong I visited a large field of turnips, the tops of many of which had been completely eaten, and what remained was rapidly being devoured by the grasshoppers. At Castor, Que., which is about half way between Baskatong and Maniwaki, one farmer had sown turnips twice and had lost both crops. On July 30, the grasshoppers were working in his oat and wheat fields. I was much amused at a method which was being adopted to save the crop of turnips at Baskatong. A small boy was kept walking up and down the rows of turnips with a branch in his hand, with which he endeavoured to drive off the grasshoppers. Of course, almost as soon as he had passed, the insects immediately swarmed back to the plants and continued their work of destruction. The species which was responsible for the damage was the Lesser Migratory Locust, *Melanoplus atlanis,* Riley. I advised them to try the Criddle mixture, which had given such remarkable results in Manitoba. The following quotation is from a letter I recently received from Mr. Criddle, of Treesbank, Man., who devised this mixture: "There has been another rather bad outbreak of locusts here, which has necessitated several applications of the Criddle mixture. The result has been entirely satisfactory, the mixture having undoubtedly prevented much damage. I was beginning to be afraid that I had over-estimated the value of horse droppings as an attraction, but I am glad to find that such is not the case."

The Grain Aphis (*Macrosiphum granaria,* Kirby) was present in large numbers in the Ottawa District. In the Gatineau country I saw many fields, at the end of July, which were infested. Fortunately, the outbreak, as usual, was attended by parasites which greatly reduced the numbers of the plant lice. Some fields of oats, however, at the above date, looked as if they had been much weakened by the attacks of this insect.

The Greater Wheat-stem Maggot (*Meromyza Americana,* Fitch.) was conspicuously present in wheat near Ottawa. Larvæ collected on July 9th were apparently full-grown, being about a quarter of an inch in length. In some experimental wheat plots on the Central Experimental Farm the "silver tops" or "deadheads," as they have been called, were rather abundant, but were not present, however, in sufficient numbers to affect materially the resultant crop. They were especially noticed among wheat of the variety called "Bishop."

The Apple-leaf Hopper (*Empoasca mali,* LeB.) which did so much harm in eastern Ontario in 1908, was again present on potatoes in injurious numbers in the Ottawa district. Its work was supplemented very much this year, however, by the Potato Aphis and the Potato Flea Beetle, particularly the former. On October

6th, I was present in a field when the potatoes were being harvested, and was surprised to see the crop so poor. I was told that the above insects were largely responsible for the small crop. On the 14th of September, when examining some potatoes, I noticed many of the nymphs of the Apple Leaf Hopper, and on the same day in an orchard close by, the adults were flying in thousands around apple trees. On July 14th some of the mature insects were noticed on potatoes on the Experimental Farm. Up to this date I had not heard of any damage in the Ottawa district by this insect.

The Potato Flea Beetle (*Epitrix cucumeris,* Harr.), besides injuring potatoes, as above mentioned, attacked to a very noticeable extent a number of plants of the Wonderberry which were growing a short distance away. The Flea Beetle was not present in the district in such numbers this year as it was in 1908. As a rule it is more numerous in hot dry summers.

Root Maggots were not much complained of in the district during 1909. They were present, of course, as they always are, but as far as I can learn, not much damage has been done by them. On the Experimental Farm, for instance, hardly an onion was destroyed by these larvæ. On September 14th I saw them working to some extent in an experimental row of winter radishes.

Cutworms were present, as usual, in injurious numbers. At Carp, about 20 miles from Ottawa, an outbreak occurred towards the end of June. Mr. Sirett, the resident representative of the Ontario Department of Agriculture, reported the matter to me, but unfortunately specimens of the larvæ were not received. Mr. Sirett thought, however, that the species was the Variegated Cutworm, *Peridroma saucia,* Hbn. Injury was done to field crops, but just what these crops were, I did not hear. About the middle of July the Red-backed Cutworm was present in fair numbers in a large field of mangels on the Experimental Farm. The larvæ on the 15th July were about full-grown. An application of poisoned bran soon stopped any further injury.

The Striped Cucumber Beetle (*Diabrotica vittata,* Fab.) was particularly numerous during the past season. It appeared on some cucumbers in my garden on June 15th, just as the plants were up nicely. On July 3rd I saw many in copulation. At Billings Bridge, near Ottawa, it was particularly reported to be injuring squashes. It also to some extent attacked melons, and was complained of by many of our market gardeners. As this beetle is very active, any application of poison must be frequently renewed. The leaves should be dusted with Paris green mixed with land plaster or lime in the proportion of one pound of the poison to fifty of the diluent, if necessary every second day. Bordeaux mixture is also a useful remedy for this insect as well as for the Cucumber Flea Beetle which often does serious injury.

The Black Blister Beetle (*Epicauta pennsylvanica,* DeG.) appeared suddenly at several places in the district, and did locally noticeable damage, particularly to potatoes and tomatoes. Plants in flower gardens were also attacked, and in some instances the foliage completely eaten. In one garden near Ottawa 100 splendid Clematis plants were defoliated, the beetles appearing on the 23rd June. On June 28, they were present in conspicuous numbers in the Arboretum of the Central Experimental Farm and were attacking plants of the genus Thalictrum, in the perennial border. As is well known, these beetles in their larval form are predaceous on the eggs of grasshoppers, so generally speaking it is not advisable to destroy them with arsenical sprays. They can often be driven from a crop by several boys walking across it and waving from side to side a bough of spruce or other conspicuous branch. As these beetles are easily disturbed they will fly ahead, and on reaching the edge of the crop will disperse and as a rule not return

ATTACKING FRUIT CROPS.

The fruit crop in the Ottawa district was on the whole a very fair one. Weather conditions have been excellent for the maturing of fruit. Insects have not been especially destructive, and growers who sprayed their trees regularly were not much troubled.

The Codling Moth (*Carpocapsa pomonella,* L.) did a good deal of damage in unsprayed orchards in Eastern Ontario. The intelligent fruit growers of the district, however, were not troubled to any serious extent by this insect. A friend who lives at Aylmer, Que., about 9 miles from Ottawa, told me that every apple in his garden was wormy. He had, of course, neglected to spray his trees.

Plant lice were the insects which were most abundant in orchards in the district during the past year. The season has been a remarkable one for plant lice of all kinds. Apple and plum trees were badly attacked, and where small trees were infected, serious damage resulted. During the early part of June the plant lice were enormously abundant in orchards near Ottawa, but towards the end of the month it was noticed that important parasites were appearing and doing splendid work in reducing their numbers. When orchard trees become badly infested with plant lice, it is a difficult matter to destroy the insects, on account of the curled up condition of the leaves, making it almost impossible to reach the insects with any contact insecticide. In eastern Canada, fortunately, these insects do not, as a rule, seriously injure apple trees, but in British Columbia, the Apple Aphis is in some years decidedly destructive, and frequent treatment is necessary. The Woolly Aphis of the Apple was fairly prevalent in the Ottawa district during the past season. On September 14th, I saw a number of young apple trees which were much infested.

The Pear-tree Slug (*Eriocampa cerasi,* Peck.) was again noticeably present on plum and cherry. The foliage of some trees examined in September was much eaten by the slimy dark coloured slugs of this sawfly. The insect is one which is easily controlled by spraying with any of the arsenical poisons.

The Currant Worm (*Pteronus ribesii,* Scop.) was complained of by growers of currants. The second brood of larvæ were very numerous in a large patch of red and white currants near Ottawa on July 12. They first appeared a few days before this date, and were quickly stripping the bushes of their foliage. The first brood of this insect, which appears when the leaves are attaining full size, are easily controlled by Paris green or arsenate of lead, but for the second brood, which appears just as the fruit is ripening, white hellebore is recommended, either dusted upon the bushes, or applied as a spray, one ounce in two gallons of water. The first brood should be treated thoroughly so as to reduce the numbers of the second brood.

The Currant Aphis (*Myzus ribis,* L.). Almost wherever currants were grown the past season they were attacked by large numbers of this plant louse. In eastern Ontario we received many complaints of the work of this insect. Unfortunately, unless the bushes are sprayed with kerosene emulsion or whale-oil soap, as soon as the aphides appear, and before they cause the leaves to blister and curl, it is difficult to get good results from the work. It is necessary to force the liquid well up beneath the leaves. This can be done by attaching a piece of bent pipe, bearing the nozzle at the end, to the rod of the sprayer.

ATTACKING FOREST AND SHADE TREES.

Cankerworm larvæ were more abundant in the spring of 1909 than they were in 1908. On the 4th June they were half grown. At Beechwood, just outside of Ottawa, beech trees were badly attacked, the result of their depredations being easily seen. When ornamental trees are attacked by these caterpillars, it is important to apply the arsenical poison while they are small. They can then be easily killed at the ordinary strength used for leaf-eating insects. When they are more than half an inch long they are a good deal more difficult to kill, and consequently much stronger sprays must be used.

The Spiny Elm Caterpillar (*Euvanessa antiopa,* L.) was abundant on elm trees throughout the district. On June 21, larvæ about one and a quarter inches long were noticed. Specimens which were collected had become full grown and changed to chrysalids by July 10. The species is intermittently abundant at Ottawa, and some years it is not an uncommon sight to see small elm and willow trees entirely stripped of their foliage.

Elm trees seemed to be particularly attacked by insects during the past season. The Woolly Elm-leaf Aphid was very abundant and many enquiries were received concerning it. By the middle of June the conspicuous colonies were much noticed. The Cockscomb Gall was also numerous in the district, the leaves of many elm trees being covered with these galls. Near Maniwaki, Que., on July 29, I saw large numbers of the Plum Gall, *Pemphigus ulmifuscus.* The galls were large and on most of the leaves of the infested trees there were at least two and very often three or four galls present.

The Spruce Budworm (*Tortrix fumiferana,* Clemens.) This insect caused much anxiety among the lumbermen of the Ottawa district. Reports were received from the upper Gatineau that some insect was ravaging the spruce and balsam forests, and as a result I was sent up into the infested area to find out the nature of the trouble. The result of this investigation is given in a separate paper which I hope to present shortly. At Ottawa, thousands of the moths were noticed flying around bushes and trees of all kinds on July 20th. They were even abundant all through the city, and on almost any bush or tree being disturbed, many of the moths would fly out from the foliage on which they were resting.

The Larch Sawfly (*Nematus Erichsonii,* Hartgn.) was also very prevalent wherever larches were growing. It was noticed in considerable numbers on some ornamental larches on the Experimental Farm, on July 20, and at this time the larvæ were about full grown. Up the Gatineau River from Ottawa as far north as Baskatong, I noticed all through this area at the end of July the results of the work of this larvæ. Many trees were entirely stripped of their foliage. Along the railway, between Ottawa and Montreal, the defoliation of these handsome trees was also conspicuous.

The work of the Spruce Sawfly was also noticed to some extent north of Maniwaki, and larvæ were found to be full grown on July 30. At this date most of the larvæ had disappeared.

The Bronze Birch Borer (*Agrilus anxius,* Gory.) is seriously injuring birches in the Ottawa district. The result of the work of this insect is easily seen at the Central Experimental Farm, where practically all of the cut-leaved birches are dying. This insect has not been mentioned very much in Canada as yet, but in northern portions of the United States it has done a good deal of damage. The presence of this borer is soon shown by the dying of the tops of the trees. This is owing to the fact that the insect first attacks the tops, which results in the killing of the upper limbs.

The Fall Webworm (*Hyphantria textor,* Harr.) was again present in conspicuous numbers throughout Carleton County. Larvæ were seen to be just emerging from the eggs at Ottawa on July 8, and a small nest on lilac was observed on July 14, the caterpillars in which were only a day or two old. Full grown larvæ were noticed as late as the 6th October.

ATTACKING GARDEN PLANTS.

The Tarnished Plant Bug (*Lygus pratensis,* L.) was very troublesome in gardens the past season. As is well known, this insect not only does injury by sucking the juices from the leaves, but it also pierces the flowers of many plants, thus destroying them. In September the adults were present in thousands around apple and other trees. As they pass the winter in this state, beneath almost any surface shelter, it is important that all garden rubbish be burned in autumn, so as to reduce the hibernating quarters for this and other kinds of injurious insects.

The Destructive Pea Aphis (*Nectarophora pisi,* Kalt.) was again present in 1909 in the district, on sweet peas in gardens. The first colonies were noticed on July 26. At this date I could not find any winged specimens. The attack, however, was not nearly so severe as the outbreak of 1908. In early September I noticed that the parasite *Megorismus Fletcheri,* Crawford, which was described in the *Canadian Entomologist* last March, from Ottawa material, was present in goodly numbers. From parasitized plant lice collected on September 2nd, I secured a further series of the parasites, the specimens emerging on September 15.

Many plants in gardens were seriously injured during the past season by Red Spider. At the Central Experimental Farm, towards the end of July, Phloxes particularly were seen to be dying from the work of this mite. Few garden plants are free from its attack, and as these creatures are so small, their work is generally unnoticed until a good deal of harm has been done. Flowers of sulphur are useful in destroying Red Spider and may be applied in the proportion of one ounce to every gallon of water. As the mites occur chiefly on the underside of the leaves, the spray should be forced up from beneath so as to reach them.

The interesting and rare little Tortrix (*Sparganothis flavibasana,* Fern.) was again rather destructive on a few bushes of Lonicera of the Caprifolium group at the Central Experimental Farm. This is the third year in succession that this insect has appeared on the same bushes. This year the larvæ were mature on June 15.

DIVISION NO. 3.—TORONTO DISTRICT. BY J. B. WILLIAMS.

The Tussock Moth has been, as usual, quite plentiful on many of the shade trees in the city streets.

At the beginning of the summer the Park Commissioner had many of the trees sprayed with arsenate of lead, and later on, towards the fall, several gangs of men were employed to collect the cocoons; but the city appropriation was not sufficient to do the work thoroughly, and as a further grant was refused, the work of collecting the cocoons has come to an end for the present year, just at the time when it might be most successfully pursued.

Early in the summer one of the Park Commissioner's men brought me a mple of Elm bark covered with a scale that was doing much damage to several trees. I sent it to Mr. Gibson at Ottawa, and he determined it as the Woolly Elm-Bark Aphid (*Schizoneura Rileyi*). They have treated some of the infested trees with whale oil, as Mr. Gibson recommended, and found the results satisfactory.

The Aphid seems, at first, to have been confined to small trees; but Mr. Cameron, the Park Commissioner's assistant, says that it has also begun to attack the small branches of the larger Elm trees, and he fears that it will give them a good deal of trouble before it is eradicated.

Prof. Ramsay Wright had during this summer a good many of his dahlias injured by a bug, which pierces the plant just below the flower bud, and so spoils the blossom. He brought a specimen down to the Museum, but it was mislaid somewhere so that I cannot give the name of the species.

I asked another gentleman, who grows dahlias in the west end of Toronto, if his plants had been injured in this way. He replied that he had not seen any bugs on them, but his dahlias had been a failure this year. Perhaps the bugs may have done some of the mischief without being detected in it.

Division No. 4.—East Toronto District. By C. W. Nash, Toronto.

The summer of 1909 was remarkable for the dearth of insect life in this neighborhood. Even such butterflies as the Cabbage White, Clouded Yellow and Monarch were remarkably scarce and little or no damage was done by the larvæ of the Cabbage butterfly in the large market gardens of East York. The Monarch (*Anosia archippus*), which usually appears early in June was not seen until the first week in July. From that time to early September, when the southward flight takes place, only an occasional specimen was visible. No great host of these insects passed from east to west when migrating as in former years, so that if they do not breed in the south this winter it would seem probable that the species would be very rare in Canada next summer.

Papaipema cataphracta, the larvæ of which, by boring into the stems of plants, have during the last few years done much mischief in flower and vegetable gardens, were not noticed at all this season nor did I find *P. purpurifascia* in the roots of Aquilegias.

It would be interesting to know the cause of the almost total disappearance of *Cosmopepla carnifex*. For some years this insect increased yearly with astonishing rapidity, reaching its maximum in 1907, when the stems of all the Aquilegias, Penstemons and some few other plants grown near here were literally covered with them. In 1908 their numbers were greatly reduced and this last summer I only saw one specimen. There were no evidences of parasites having attacked them. It seems probable, therefore, that weather conditions of last winter were unfavourable and that they perished while hibernating.

The larvæ of the Tussock Moth though extensively parasitized in 1908 were about as abundant as usual on the shade trees of Toronto.

Various matters referred to in the Directors' Reports were discussed by Messrs. Caesar, Treherne, Hewitt, Bethune, Jarvis, Tothill, Nash, Gibson and others. The Woolly Aphis was stated to be rarely found on the roots of apple trees in the Niagara district; it hibernates as a stem-mother in the crevices of bark, and early in spring new colonies are produced. It was reported that in many parts of Ontario, where grasshoppers were so abundant this year, the Criddle mixture was found to be entirely effective, though in one or two localities complaint was made that the grasshoppers would not touch it. This failure may have been caused by some defect in making the mixture or in the mode of application. In Manitoba this year it has proved to be an excellent remedy.

The Tussock Moth was said to be on the increase in country districts, though largely kept in check by its parasitic enemies. In Toronto the methods employed for its control were much criticized; spraying was done towards the end of July when a large proportion of the caterpillars had ceased feeding; those in charge of the operation had so little experience that they used nozzles that were too coarse, and allowed the pavement and roadway to receive more of the arsenicals than the trees. Subsequently the gathering of cocoons was begun much too soon and then the appropriation was exhausted and further supplies refused when this part of the work might have been performed most effectively.

OBSERVATIONS ON A FEW INSECTS OF THE SEASON.

By Lawson Caesar, Ontario Agricultural College, Guelph.

A year ago last June, when in the vicinity of Niagara-on-the-Lake, I happened to notice a number of white pine trees that seemed to me to have an abnormally large number of dead twigs. On investigation it seemed evident that some sort of borer had been the cause of their death as every twig had a longitudinal hole in the wood and a considerable amount of castings at the entrance. No insects, however, were found in the tunnels or on any of the twigs examined. On the 21st of June of the present year I was in the same district and again examined the same trees. Once more it was clear that borers had been at work. After examining as many twigs as time permitted four specimens of beetles were found in the tunnels. Two of these belonged to one species and the other two to another, but they were all apparently Scolytids. The larger species was not more than about half the size of the Shot-hole Borer (*Scolytus rugulosus*), and the smaller species was only half the size of the larger.

Not having seen this injury elsewhere I thought that it might be the work of some dangerous pest that had just crossed the border and might later on spread through our pine forests. Accordingly I sent specimens of the injured twigs to Dr. Hopkins, of Washington, who has charge of Forest Insect investigations. No beetles were sent with the twigs because I supposed he would be perfectly familiar with their work and could tell me the cause without them. His letter is as follows:

> "I have your letter of the 22nd. instant and the specimen of white pine twig that has been injured by a beetle. I examined the specimen and find the work of the beetle, but to my great disappointment no insect could be found. This is a most interesting example of injury, differing from anything I have seen in the East, although I have seen something like it on the Pacific Coast and in the Rocky Mountain region. Therefore I wish you would send a good supply of infested twigs in order that I may be sure to get the beetle. It is evidently a scolytid, but without specimens it cannot be identified. The blighted appearance of the twig is similar to that which was very prevalent throughout northern New England last summer, but in our quite extensive investigations, in which many different causes were found for the dying of the twigs, we did not find evidence of the work of this insect. Therefore the matter is of special interest, and I hope you will send us plenty of specimens without delay, for fear that they may leave the twigs. After we have made a study of the matter we will be very glad to give you further information on the subject."

On receipt of this letter I at once sent all the specimens I had with a request that he keep one of each species and return the other two. A considerable number of twigs were also sent through the kindness of Mr. Alfred Eastham, who happened to be about to visit the infested district. Dr. Hopkins in reply to my note accompanying the specimens said:

> "I have your letter of the 1st. inst., and two spcimens of balsam mounts, also two specimens of beetles mounted on card points, and have just now received a bundle of pine twigs collected July 6th, at Niagara-on-the-Lake.
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> "The beetles in balsam are evidently a species of *Pityophthorus*, but it is impossible to identify them beyond the genus when mounted in this way, and even the genus is uncertain. They are far better for identification mounted dry. The other two specimens on card points represent an undescribed species, evidently of the genus *Conophthorus*, and is allied to a number of species that we have found to be injurious to the living twigs of pine, Douglas fir, etc., in the Western States. I am retaining one of the specimens for further study, and am returning the others to you as requested.
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> "The specimens of twigs are of unusual interest. A superficial examination seemed to indicate that they represented the common troubles investigated in New England last season, which were found to be due to several causes. A more thorough examination, however, revealed the fact that certain of the twigs with a peculiar grayish appearance were infested with living larvæ, apparently a *Pityophthorus*, and in one dead twig an adult *Pityophthorus* was found. We shall have no trouble in rearing these larvæ to the adult stage, after which we shall be able to identify them and shall write you further.
>
> "One or two forms of the twig blight are also represented by the specimens sent, one associated with a light yellow spot on the twig, which is believed to result from the presence of the nymph of spittle insects, which are often very abundant on pine twigs. Some of the twigs are also thickly infested with *Chermes pinicorticis*, which reduces the vitality of the twigs and trees. These *Chermes* are of special interest, because they have alternate hosts, that is, one or more generations will develop on pine and then migrate to spruce, where they cause galls on the twigs, from which they migrate back to the pine, larch, etc., and there is one form of twig blight which is commonly met with where the white pine and spruce grow together. If, later in the season, you find that twig blight is developing under such conditions, I shall be very glad indeed to have specimens of the twigs."

It is too soon yet to expect any further word from Dr. Hopkins.

I have not had much chance to visit districts where the white pine is found so that I cannot at present say just how far this insect has spread through the province, but since Dr. Hopkin's last letter I have found its work in a pine grove about three miles south of Stoney Creek, and Mr. Jarvis has found it in Peel county near Inglewood.

It is quite clear that if these beetles were to become very abundant they could do enormous damage to our pines. So far they can hardly be said to be very serious, although about five per cent., or possibly more of the twigs have been killed. Trees that were infested last year did not seem any worse infested this year.

It must not be supposed that all the dead twigs seen on pine trees are killed by these insects, because in several districts numerous twigs had died, but on examination there was no evidence of any insect work.

Last year when in Prince Edward County I observed what was to me a new kind of injury on apples. It took the form of small, circular, brown, dead areas about one-quarter of an inch in diameter and one-eighth in depth. The skin over these cavities was always ruptured in the centre. Apples thus damaged were shown last year at our annual meeting, but no one seemed to know the cause. A few weeks after the meeting on looking over Prof. Crandal's excellent bulletin on the Plum Curculio I felt convinced that this insect had done the injury; consequently this autumn I asked Mr. McVannel, the Agricultural Representative at Picton, to see whether he could find any of the Curculios at the work. He discovered two early in September, and on the twenty-fifth of the same month, while in the same county, I found four of the insects at these cavities, two of them having just finished making fresh ones.

The apples worst attacked so far as I could discover by a very limited inspection were Golden Russet, Cranberry Pippin, Ben Davis and Snow. Spy and other varieties with very glossy surfaces seemed to escape. Some of the above mentioned varieties had as many as twenty injuries on a single apple, the majority of them usually being found near the calyx. Orchards that were not cultivated were, as one would naturally expect, much worse damaged than cultivated ones.

This sort of injury is done by the newly emerged beetles before they hide away for the winter and seems to begin about the third week in August and continue to the first week in October or possibly a little later.

It is rather remarkable that there is not considerable loss from this cause in the western counties of Ontario when it is so common in Prince Edward county and, as I have lately been informed, in the counties further east. Prof. Crandal states that in Illinois apples are often severely damaged by these feeding punctures, and Prof. Quaintance says that this sort of injury is especially common in the colder states and districts of North America.

A few interesting cases of parasitism have been observed during the season. For the previous two years the Shot-hole Borer (*Scolytus rugulosus*) has been doing great destruction to cherry, peach and plum trees in the Niagara district. Some fruit-growers lost as high as sixty trees in a single year. Many were afraid that the destruction would increase year by year and endanger the fruit industry. Very fortunately this year the borers have not done nearly so much damage. The reason for this seems to be solely the great increase in parasites. Early in the season, from a small piece of branch only a few inches long, I reared fourteen parasites. In September, while visiting St. Catharines and the surrounding district, numerous parasites could be seen on trees that had been attacked by the borers. A number of these were brought back and proved to be the same as most of those reared in the spring. All the parasites obtained so far are Chalcids, and much the commoner species is, so far as I have been able to determine it, *Chiropachys colon*.

On the trip on which the parasites of the Shot-hole Borer were found in abundance I was also requested to have a look at a maple tree that was said to be covered with some species of scale. On examining it I saw that the insect was the much dreaded Terrapin Scale (*Eulecanium nigrofasciatum*). On first sight I felt sure that the tree would have to be cut down and burned, but on closer evidence it was seen that nearly all the adult scales had been parasitized and there were only a comparatively small number of the living immature scales present. As it was quite clear that the parasites were looking after the scale in a satisfactory manner I informed the owner of the tree that he need not do anything except leave these friends to fight the battle for him.

One regrets to have to report that two of our worst insects have spread to new districts. The San José Scale has been found in one orchard in Prince Edward county and has come safely through the winter on nursery stock planted there last year. Efforts are being made by the provincial authorities to stamp it out before it can become well established and spread.

The other insect is the Railroad Worm. I have received specimens of apples infested by it from Bowmanville and from Cobourg, the latter having arrived only a week ago.

One new pest, the Blackberry Miner (*Scolioneura capitalis*) is becoming very abundant, especially in the Niagara district, and threatens to cause great loss to growers of this fruit unless a remedy can soon be found or parasites come to the rescue.

NESTS OF THE BROWN-TAIL MOTH IN IMPORTATIONS OF FRENCH NURSERY STOCK, 1909.

By Arthur Gibson, Central Experimental Farm, Ottawa.

The inspection work in Canada which was necessary in view of the finding of nests of the Brown-tail Moth in shipments of nursery stock from France, is treated of fully in the annual report of the Division of Entomology and Botany for 1908-1909, which is now in press.

A short statement, however, of the work which was done in the provinces of Ontario and Quebec may be of interest to the members of the Society attending this meeting.

Nests of the Brown-tail Moth containing living larvæ were discovered early last January in New York State on apple, pear and cherry seedlings and quince stocks imported from France. This fact was at once communicated to the Division of Entomology, and a circular giving this information and asking for advice of shipments coming into Canada was at once prepared by the Director, Dr. W. Saunders, and sent out to nurserymen and others who would be interested, as well as to the press generally. On February 5th, after undoubted nests had been found in Ontario, a second circular, giving further information on this threatened invasion of such an injurious insect, was prepared by the Director and the writer, and sent to nurserymen.

The first nest found in such imported nursery stock in Ontario was on a plum seedling on 27th January. This was in the first shipment of stock examined. From this date until May 20th, every shipment of nursery stock coming into the provinces of Ontario and Quebec was examined carefully, either by me or by Mr. Harry Arnold, the Provincial San José Scale Inspector, of Pelham Centre, who had been instructed by Mr. P. W. Hodgetts to assist me on certain dates in this work. Every nurseryman who imported such stock was visited, as well as a number of seedsmen and florists. Thirty different firms or individuals in all were visited, 26 in the Province of Ontario and 4 in the Province of Quebec. A complete list of these and the nature of the stock examined and the number of nests found will be found in the report of the Division above referred to. Many of the nurserymen had to be visited several times, immediately on the arrival of stock.

The examination of this imported stock had, of course, to be made very carefully. Generally speaking, the whitish nests were easily detected, but occasionally small nests would be found, or some which had become broken. The nests mostly occurred between two or three of the twigs or along the main stem of the seedlings, and in size varied from less than half an inch in length and about the same in width, to about nearly three inches in length and over an inch in width.

In the provinces of Ontario and Quebec, 1,503,129 plants were examined. These consisted largely of apple, pear, plum and cherry seedlings, to be used either for grafting or budding. In the province of Ontario, 188 nests of the Brown-tail Moth were found, and in the province of Quebec, 8, making a total of 196. These were found as follows: 100 on pear, 56 on apple, 28 on plum, 5 on quince, 1 on cherry, 2 on rose, 2 on spiræa, 1 on sugar maple and 1 on Prunus pissardi.

We have reason to expect, owing to the way in which the consignments of nursery stock were examined, that every nest of the Brown-tail Moth present was found. No report has come to the Division since this inspection work, of any larvæ of the Brown-tail Moth having escaped from these shipments and established themselves. Nurserymen and others were strongly advised to burn all packing, etc., in the cases in which the nursery stock was shipped, as well as the cases. After the trimmings from the fruit seedlings had been burned, as an extra precaution the importers were advised to dip the stock in kerosene emulsion, or a standard miscible oil as was being done in New York State. If the packing, etc., from these cases were not destroyed before spring, it can be readily seen how some of these caterpillars might have got out and established themselves.

In the report of the Division now in press there will also be found a statement of some experiments with hydrocyanic acid gas to kill the larvæ of the Browntail Moth. These experiments were conducted in a fumigation box having 128 cubic feet of contents. Varying strengths of gas were tried, from the one used in the federal fumigation houses to destroy the San José Scale, viz., 1 ounce of cyanide of potassium, 1 ounce of sulphuric acid and 3 ounces of water to every 100 cubic feet of air space, exposure 45 minutes, to three times this strength, the exposure being lengthened to 2 hours. In these experiments many of the larvæ had left the nests and were active on the sides of the glass jars, with cheese cloth coverings, in which they had been kept. These experiments, although not very extensive, went to show that fumigation with hydrocyanic acid gas evidently cannot be relied upon as a practical remedy for this insect when in its winter condition. Even when the strength of the gas was three times that used in our federal fumigation houses, and the exposure very much lengthened, only a very small percentage of the larvæ which had left the nests were killed. It would certainly require considerably greater strength and much longer exposure to kill the larvæ when within the nests, and owing to the tough, closely woven nature of these nests the outcome would be very doubtful. In this work of fumigation I was assisted by Mr. Herbert Groh.

THE LARGE LARCH SAWFLY.

(*Nematus Erichsonii, Hartig.*)

Dr. C. Gordon Hewitt, Dominion Entomologist, gave a brief description of his work on this insect in England, where it is becoming a serious forest pest. Its distribution in Canada is also increasing and the larches (*Larix americana*) as far west as Winnipeg, are now suffering from the attacks of this sawfly, which destroyed most of the larches in Eastern Canada subsequent to its appearance in 1882.

Only one brood was found to occur—the deposition of the eggs and the emergence of the larvae extended over a considerable period, and might give the impression that the species was double brooded.

The chief parasite was found to be *Mesoleius aulicus,* Grav., and investigation showed that in 1908 the average number of cocoons parasitised was 6 per cent., in the present year it was found to have doubled. Another ichneumon, *Microcryptus labralis,* Grav., was bred out and this insect is probably a hyper-parasite on (*M. aulicus.*)

One of the most potent factors in the natural control of the insect was the Field Vole (*Microtus agrestis,*) which extracted the larvæ from the cocoons during the winter, during which season the larvae form a large portion of their food. In one plantation about 50 per cent. of the cocoons were emptied in 1908 by these rodents.

Certain species of birds, such as the starling, rook, jackdaw and tits were of great importance in destroying the larvæ in large numbers. A scheme of attracting these species of insectivorous birds by means of nest-boxes was initiated and the results of the experiment were very gratifying, 33 per cent. of the boxes being utilized in the first year.

A species of *Cordiceps,* a fungous parasite, was found to be destroying a large number of the pupating larvae, and as the probable method of infection is terrestrial, this fungus may prove to be an important means of natural control.

The eradicative measures which were carried on against the larvae on the young trees were spraying with lead arsenate and crushing the larvae when they are in the "clustering" stage of their life-history, both of which measures were very effective in preserving the foliage of the trees under 8 feet high. Such measures of course cannot be employed in the case of large tracts of young self-sown larches, such as occur in many places in Canada; in such places natural means of control must be relied on.

NURSERY WORK IN ONTARIO.

By R. C. Treherne, Grimsby.

It is with a great deal of pleasure that I am enabled to give you a report on the Nursery work in Ontario. This year the Ontario Government, for the first time since 1902, instituted a general summer inspection of the nursery stock of Ontario, with a view to more effectually check the increase, distribution and ravages of the San José Scale and other pernicious insects which are prevalent in the nurseries, and also to gain a more precise idea of the nature of these attacks and the extent of their prevalence. A report, such as I am attempting to present to you at the present time, must necessarily be of a somewhat general character for the reason that the work is not yet finished and the final report is not yet completed. Nevertheless I will endeavour to outline to you the course adopted by the Government, which ultimately led to the formation of this summer inspection. The inspection is principally aimed at the San José Scale, but other insects, fungi and plant diseases are also included.

For the last three years sub-inspectors were appointed in the Niagara Peninsula where the bulk of the nursery stock is grown, and to quote from last year's report, "It was the duty of these men to watch closely to see that all nursery stock was properly fumigated before being shipped out, and also to report any instances of scale being found in the nurseries." Presumably the work of these inspectors was sufficient to show that the scale had become localized in many nurseries, and, in order to effectually combat the insect and prevent its spread it was expedient to discover its breeding places and distributing centres. With that view, then, the course of summer inspection of all nurseries was adopted; the Act which had already been passed prohibiting the sale of scale-infected stock was enforced, and inspectors were authorized to break down, or otherwise prevent from sale, affected stock in the nursery row.

The work was started in the Niagara District early in August of this year with two, and sometimes three, inspectors employed. They commenced at Stoney Creek and worked through to Queenston and at the present time (Nov. 4), are engaged in the Welland and Fonthill Districts.

The work has been delayed somewhat owing to the enormous amount of stock that is being grown and is ready for sale at the present time. According to last year's Fruit Branch Report, there were well over two million fruit trees growing in the nursery rows, to say nothing of grape and small fruit cuttings and the various ornamental shrubs that are being propagated. This year, I believe, the amount is still larger when all saleable stock is computed.

It is the duty of the inspectors to make a tree to tree inspection, locate the scale and dig up and destroy affected plants; and since a single man can only examine 15,000 to 20,000 trees a day, according to the nature of the stock and the care it has received, it can be imagined that the work is assuming great proportions. But it is work along the right line, and the nurserymen realize this.

Here it might be desirable to lay greater stress on the work of the local inspectors, whose duty it is to examine and enforce the law on those orchards found to be infested by scale throughout the country, but specially in the neighborhood of nurseries. For it is only by destroying the root of an evil that we can hope to accomplish results, and so long as infested orchards remain, just so long will the scale be found in the nursery.

From observation this summer it appears that the orchardist in very many cases neglects his duty to the Peninsula, and that the nurseryman in nearly every case is anxious to reduce the scale to a minus quantity.

Speaking generally, the San José Scale has been found in nearly all the nurseries thus far examined, and is found to be present in greater or less quantities, varying from one tree to several hundred, dependent on the locality. But little scale was found in the nurseries of the Stoney Creek District, but a considerable amount was found in the old Niagara District. A varying quantity was found between these two districts with a gradual tendency to increase from the former towards the latter. Scale is also very prevalent in the Fonthill District—greater infestation being to the north and north-west of the village.

Birds, and the procuring of scaly bud-sticks appear to be the principal means of the distribution within the nursery, while shipment after faulty fumigation seems to increase the area of infestation outside. It is peculiar that sometimes a three year old tree literally encrusted from the twigs to the ground, will be the only tree in a row affected, thus proving the necessity of a tree to tree inspection.

Remedial measures most commonly in use in the nursery are the Lime Sulphur Spray, Whale Oil Wash and the Carlson Mixture.

Besides the San José Scale, there is a long list of insects found on nursery stock. The most important, the most frequent and the most evenly distributed being Pear-Tree Slug, Leaf-Hopper, Red Spider, Oyster-shell Bark Louse, Blister Mite, Woolly Aphis, Bucculatrix, and the Trumpet Leaf-Miner.

From the botanical standpoint, the Cherry Mildew, Black Rot of Grape, Fire Blight, Bear Scab, Black Knot, Crown Gall and Hairy Root, are the most frequently observed fungous diseases.

It is hoped that future years will see this scheme of summer inspection continued. A fuller and more complete account of this year's work will probably be published in the Report of the Fruit Branch, Department of Agriculture.

During the discussion that followed, attention was drawn to Clause 2 of the Nursery Inspection Act, which states that:

"The Council of any city, town, township, or incorporated village may, and upon the petition of 15 or more ratepayers shall, by by-law, appoint at least one inspector to enforce the provisions of this Act in the municipality."

It was considered that there is a weakness in the clause which authorizes a Council to appoint an inspector, chiefly because the local man, from the very fact that he is a local man, does not inspire confidence. The fruit-growers and farmers with whom, in the performance of his duty, he comes in contact, ask one another the questions: "What does he know about the scale?" "Does he know the scale better than we do?" And further, the local inspector does not wish to risk disputes and wrangles and loss of his popularity by condemning a neighbor's orchard. On this account it would seem better to appoint as inspectors outside men, and that the Government should assume entire control of the work.

The following resolution was then unanimously adopted:

Moved by Dr. C. Gordon Hewitt, Dominion Entomologist, seconded by Mr. A. F. Winn (Province of Quebec), "that this Society, having heard from Mr. Treherne an account of the methods and work being done by the inspectors, wishes to express its great appreciation of the Ontario Government's arrangements for the inspection of nursery stock this season, and hopes that this important work will be continued with equal, or even greater, zeal in the future."

SOME GUESTS AT THE BANQUET OF BLOSSOMS.

By F. J. A. Morris, Trinity College School, Port Hope.

In 1905, my first season of collecting, I went over to England at the end of June on a botany trip. I had already begun to watch for beetles on blossoms before leaving Canada, though my chief hunting ground had been the bark of trees. In England I knew that the latter game-preserve was practically out of the question, as timber is far more scarce, and nearly all the woods are kept too clean for fallen timber to lie or wood to rot. If I meant to do any beetle-hunting, it must be by some other method, and I naturally made up my mind to combine hobbies by carrying a collecting-bottle out with me on my daily botanical rounds.

My first stay was on a small estate in Chislehurst, Kent. Here, in this garden within a garden, while wandering through a wood of hazel and oak, I came on a large clump of tall umbellifers in full bloom. I knew already from Fowler's and other books that such blossoms were a favourite haunt of certain beetles, and I made my way cautiously along a hedge of rhododendrons towards the clump. As I did so, there rose from between my feet a dark brown hawk-like bird, that flew up into my face and hovered for some moments in front of me; it was a nightjar, the famous goat-sucker of popular superstition, menacing, but powerless to fulfil a threat, being, indeed, cousin-german to our night-hawk and whip-poor-will, with all the furtive movements and ghostly silence of the creatures that fly abroad by night and hawk beneath the light of the moon. Like the nighthawk, it builds no nest, but there among the round flint pebbles by an oak lay its pair of eggs.

When first I got to the clump of flowering plants and scanned their broad white discs of blossom, among numerous diptera and hymenoptera, nothing was to be seen except a few butterflies, but presently I saw a large black and yellow Longicorn settle on an umbel some distance off. On approaching I found two of the beetles feeding and succeeded in catching one in my hand. They were very active, as quick as sunflies and almost as wary, so that capture was far from easy. I managed, however, to get a second specimen some time after. They proved to be Strangalia armata; later on in the season I captured in North Wales a pair of Strangalia melanura, one on a composite, the other on a small umbellifer; and in Somerset, on the slopes of the Quantocks, I captured the more rare Strangalia quadrifasciata, sunning itself on a hazel leaf. The genus Strangalia is closely related to Leptura, and, like that genus, with its near allies frequents blossoms. So far I have not found any in Canada, though some species are, I believe, not uncommon. From the wood I passed into the kitchen garden, for I remembered a bed of orpine or livelong (Sedum telephium) where, 25 years ago, 1 could be sure of some Red Admirals (Pyrameis atalanta) and an occasional Peacock (Vanessa io), but alas! King Orpine's days were numbered, and Salpiglossis and Montbretia reigned in his stead. However, I spied a bed of asparagus and went over to review its ranks. I soon found that ladybirds were glutting themselves on a small dark grub about the foliage; it was probably the grub of the asparagus beetle (Crioceris asparagi), for I found a number of the mature insects on the leaves. Though very small, this beetle is extremely beautiful when alive, the vertical lines and cross-bars which appear black in cabinet specimens being of a rich dark green in the living insect. It has a curious habit when alarmed of thrusting its antennæ straight forward in front of the head and remaining motionless like a pointer; this habit is found in not a few of the Chrysomelians, as in some of the Longicorns, notably the Saperdas. I saw no trace of the 12-spotted species (*Crioceris 12-punctata;* indeed, at the time I did not know it occurred in Great Britain; but in September, 1907, I found both species on some asparagus in the late Dr. Brodie's garden in Toronto, and the last two years I have found the latter species abundant in Port Hope. In Dr. Bethune's day, I understand, it had not yet appeared there.

During the rest of my stay in England I did not do much collecting, as the month of August forms a sort of interregnum in insect activity between the early and the late broods. But I returned to Canada fully determined to prosecute my search among flowers and foliage in the coming season. I knew, of course, that I should thereby restrict my captures mostly to two or three families of beetles —the Scarabs, Longicorns and Chrysomelians, but to some such form of amateur specialism I was not at all averse.

Accordingly, from early April in the spring of 1906, I was out and about whenever I got the chance. It was not till May that my efforts met with much reward. A species of Œdemeris that frequents the dogtooth violet was almost the only capture. I had been told that a somewhat rare Longicorn was to be met with on the blossom of the trillium, but my informant could not tell me its name, nor did patient search in trilliums yield me any specimens of this family. About the 20th of May, however, blossomed the early elder, and though I wasted a great deal of time over elder clumps growing far away from woodlands, I did at last, by good luck, direct my steps to some growing on the edge of a wood about four miles north of the school. Here I found a new species of Scarab, leaden-gray in colour, though disguised for the nonce in a light yellow coat of pollen, with which it was thickly dusted over; it had long crooked hind legs that looked too clumsy to be of much use to their owner, and were, indeed, trailed along after it when it crawled. It was the male of *Hoplia trifasciata,* and I found it abundant for two or three weeks on the early elder, the choke-cherry, and the hawthorn; at first only the males were to be found, but about a week later the females became common; these at first I took for a distinct species, as they are very different in colour, yellowish-white, with three irregular bands of brown across the back; on the hawthorn, however, where the female was in preponderance, I more than once found a pair. The same mistake appears to have made its way into print, and the two sexes were at one time assigned to distinct species, the male figuring as *Hoplia tristis*, and the female as *Hoplia trifasciata*. I found also on this clump of elder a few specimens of one of our earliest Lepturas, *L. ruficollis;* and, by way of a new illustration to the old adage that "it never rains but it pours," three specimens of what at first I took to be an ant, till on looking closer I saw the straight line down the back formed by the suture of the wing-covers and the gracefully curving antennæ that mark the Longicorn beetle. It was quite new to me, and my fellow-collector, though several seasons older than I, had nothing like it in his collection. There was nothing specially remarkable about its colour, which was blackish or dark gray, relieved by some transverse pencilled lines of white, and it was only 1-3 of an inch in length, but there was an elegance of form and outline that made it long a favourite in my little collection. This enthusiasm in a grown man doubtless seems absurd to the uninitiated, and I must admit, somewhat ruefully, that I found myself an object of pity rather than envy when I "talked beetles" to a brother of mine who has misspent the last 20 years of his life tiger-hunting in Madras and bagging lions in Rhodesia, in fact, generally making ducks and drakes of all his golden opportunities to collect rare Longicorns from tropical blossoms.

In the identification of this insect occurred an episode that I hope Dr. Bethune will pardon me for introducing here. At the close of this season of 1906 I purchased a copy of LeConte & Horn's key to the genera of N. A. Coleoptera. By a somewhat rough process of elimination I had decided my beetle belonged somewhere in the tribe *Clytini*, whose most familiar representative is probably the famous sugar-maple borer, *Plagionotus speciosus*. LeConte & Horn's book made it probable that in the third group of this tribe, the *Anaglypti*, it would find its place. This group contains four genera, *Microclytus, Cyrtophorus, Tillomorpha,* and *Euderces*. Only one of these genera was at all known to me, and that from a single species (*Euderces picipes*) somewhat resembling the subject of my examination. I found first of all that the beetle I was trying to place had no ivory marks on the elytra, which put *Euderces* out of the question; the eyes were oblique and emarginate instead of round, which excluded *Tillomorpha;* it must be either *Microclytus* or *Cyrtophorus*, and the book gave one no choice, for in *Microclytus* the second joint of the antennæ was equal to the fourth, while in *Cyrtophorus* the second joint was much shorter, as it obviously was in my specimens. My fellow-collector had already sent a box of unidentified specimens to Guelph to be named, and when they came back I was naturally eager to learn the result. To my chagrin I found my little favourite christened *Microclytus gazellula*. This so mystified me that at last I wrote to Dr. Bethune, explaining the quandary I was in. To my great relief I got an immediate reply, that the beetle sent him had been identified from a cabinet specimen named by an older collector. LeConte & Horn were right, my beetle was *Cyrtophorus verrucosus*, as were those in the Guelph cabinet, though hitherto wrongly named.

I have examined a number of cabinets, and in none of them yet have I found more than an odd specimen of this beetle, nor have I met a Coleopterist who had captured it, except accidentally, as it were. But on the blossoms of the early elder, still more those of hawthorn, sometimes of choke-cherry, dogwood, spiked maple, viburnum and New Jersey tea, from the middle of May till early in July, I have found it abundant. It is then replaced by its near relation, *Euderces picipes*, which frequents blossoms all July, especially those of New Jersey tea and milkweed, though often met with also on certain of the Rosaseæ and composites. It closely resembles *Cyrtophorus*, though considerably smaller and not so elegant in form; on the side of each elytron is a transverse white band, technically termed an ivory vitta; in the first specimens captured I did not recognize a new kind till I took them out of the killing-bottle.

This finding of a new species acts as a great incentive to the collector, not merely through the stimulus and encouragement of filling gaps in his cabinet, but through the interest and education of comparing closely-allied species and genera, and gradually following out the relationship of distinct tribes as the series of intermediate forms grows more and more continuous; thus retracing, as it were, the steps of natural evolution. It was, I know, a great encouragement to me to find the wide gap between, say, the Cyllenes and the Lepturas being gradually filled in and the various stages of the transition emerging, so to say, from the unknown. I believe it was the consequent redoubled efforts made by my fellow-collector and myself the next season, more than mere luck, that brought us an interesting discovery in the middle of June. On a certain Sunday morning I captured on spiked maple a specimen of an ant-like beetle, obviously belonging to the *Anaglypti* group, but neither *Cyrtophorus verrucosus* nor *Euderces picipes*, and in the afternoon of the same day on hawthorn, my friend captured a specimen of an ant-like beetle neither *Cyrtophorus verrucosus* nor *Euderces picipes*. Neither of us noticed his discovery till we came to turn out the contents of our killing-bottles on returning home. Stranger still, the new species we had captured, when we came to compare notes, proved different from one another. By a close examination of my friend's capture, I found he had at last got a genuine specimen of *Microclytus gazellula*. My capture has not yet been identified, but it may be referred almost certainly to the genus *Cyrtophorus*.

I have been led into something of a digression here, and for purposes of this paper I may remind you that we are in the month of May, and searching for beetle guests on the blossoms of the early elder. Through the middle of the wood where I made these first discoveries flows a small stream that has eaten out for itself quite a deep ravine through the limestone, clay and marl. About 100 yards up this glen grows a large shrub of early elder that opens about the end of May; on its blossoms we got several more of the *Leptura ruficollis*, but nothing new that season. In 1907, however, while my fellow-collector was examining the blossoms, he spied a new Longicorn, of which he captured three specimens, and a day or two later, from the same shrub, I managed to get two. Though there were several other elder bushes in the wood, we have found this beetle on none of them, only on this one tree, and it has yielded us from 3 to 5 specimens every season since. As far as our experience goes the beetle is active from the end of May till nearly the end of June. In 1907, from another locality I took two specimens on dogwood blossom; in 1908 I got three or four specimens on dogwood and on the thimble-berry, and in the season just over we both saw specimens feeding on hawthorn blossoms. It is the *Pachyta monticola*, a very pretty insect with pale yellow elytra, boldly marked with black or deep crimson. This genus is closely related to the Lepturas, but broader across the base of the elytra, and thicker through the sternum; its thorax, too, instead of being rounded at the sides, is armed with an excrescence known to Coleopterists as a "process." In 1907 and 1908 I succeeded in capturing a few specimens of two more species of *Pachyta*, smaller than *monticola*, and inconspicuous in colour, black, or black with dark brown streaks on the wing-covers. They were taken late in June, feeding on the blossom of dogwood. And with every fresh discovery I swelled with pride as I found myself getting more and more intimate with this royal family among beetles, the Longicorns.

With the passing of May the early elder came to an end, but before it was over the hawthorns began to bloom all over the neighbourhood. Our first field of investigation *was* a field, an extensive pasture bordered on one side by a wood of pine, beech and maple. At first I went all about the farther end of the field wherever the snowy mass of hawthorn bush in full bloom drew me, but I soon found that it was only near the wood that my search was rewarded; the first captures were a couple of Scarabs called *Trichius piger,* a beetle looking very much like a small bumblebee and extremely active; it is abundant on blossoms from early in June till the middle of July, and may be found on a great variety of flowers. Then I got my first specimen of *Dichelonycha elongata,* another Scarab, which is particularly fond of basswood foliage, and becomes some seasons a veritable plague. Finally I came to hawthorns on the border of the wood, and here I found several Longicorns feeding. Among them three Lepturas that were new to me, *Leptura pubera, L. mutabilis* and *L. vibex,* of the last two only a single specimen. About the same date I paid a visit to the wood four miles away, to see what guests the hawthorns there were entertaining. On one bush at the edge of the wood I found both sexes of *Hoplia trifasciata* plentiful, two or three specimens of *Dichelonycha,* and a lot of *Leptura ruficollis* and *Cyrtophorus verrucosus;* and besides these a new insect that at first I passed over for a fly, till the long antennæ betrayed it; these in the female were about the length of the body, in the male twice as long; it was the more easily mistaken for a fly in that its wing-covers were reduced to a mere pair of epaulets or shoulder pads. It proved to be the Longicorn *Molorchus bimaculatus,* and was very abundant throughout June on several sorts of blossom. On another bush at the edge of the wood I found a regular colony of Chrysomelians busy in the blossoms. I sent three of these to Guelph, where they were identified as varieties of *Orsodacna atra;* in June, 1907, I found the same beetle on hawthorn blossom at Lakefield, and I have taken it also on viburnum; in no case did I find the normal form of *O. atra,* though a few of my specimens approximated very closely to it.

A curious feature about the hawthorn and its guests is that some shrubs apparently as favourably situated as others and in full bloom, were deserted and others crowded. It may prove that some species attract beetles and others do not; Gray's New Manual enumerates 65 species of hawthorn in N. A., while in Sargent's Monograph on the Cratægus in some parts of Ontario alone (as published in last year's Wellington F. N. Bulletin), no less than 95 species are distinguished. The results of closer determination in the species of plant hosts might prove interesting.

An encouraging thing about this sort of collecting is that seasons vary in the maturing of both hosts and guests, so that often you will find species frequenting blossoms that the year before they did not visit, and sometimes you will come across an entirely new insect. Two seasons ago, for instance, early in June, we found a strange beetle abundant on dogwood; it proved to be *Callimoxys,* a first cousin of *Molorchus;* in this genus the wing-covers are not short as in *Molorchus,* but awl shaped, so that the inner margins do not lie together in a straight line. Again this last season I made a new find on hawthorn in the shape of a small oak-pruner (*Elaphidion*). Much, too, may result from search in a new neighbourhood;

in 1906 I found scores of *Lebia furcata* (a small Carab of the Bombardier group) feeding on golden-rod about the margin of a swamp at Lanark, and last July I captured two fine specimens of the large blister beetle, *Pomphopœa Saya*, in Muskoka, upon nannyberry (*Viburnum lentago*).

When the hawthorn began to bloom in 1907, I went eagerly back to work my claims, for the bloom of a hawthorn last barely a week, and seems to attract insects for only a day or two. I had already ruled out the shrubs growing in the open; so I went first to the edge of the wood, but this faced west, and was exposed to a chilly wind. There was nothing to be found, and I followed the gleam of hawthorn north across some stump lands to a large wood; skirting its west and north border, I came presently to a stretch of low swampy ground that penetrated the wood in a southerly direction, and was entirely out of the wind. It was thickly grown with dogwood and spiked maple, both of which were in the prime of their bloom, and in full sunshine. The number of insects feeding on the blossoms was astonishing; in an hour or two I must have captured several hundred beetles. Besides *L. ruficollis* (with its variety *sphæricollis*), *L. vibex* was plentiful and so was *L. mutabilis*, whose name now for the first time became clear to me, both forms being abundant, the light brown and the dark gray; I found also a very small *Leptura* that was new to me (*L. subargentata*), and the beetle, *Encyclops cœrulea;* there were also a few specimens of *C. verrucosus*, and it was then that I got my unidentified species of *Cyrtophorus*. There were, of course, other families of beetles; in particular, Elaters, of which I captured four new species, one of which I have never seen except on spiked maple, the head and thorax dark brown, ending in a reddish-brown base, the elytra yellow-green, tipped with dark brown. On the same blossom in another locality I have taken three more Elaters, *Corymbites hieroglyphicus*, *C. propola*, and a third species not yet identified, prettily marked with dark wavy lines across the wing-covers; besides these, yet another Leptura (*L. 6-maculata*). *L. vibex* seems fairly to revel in these moist woody hollows, and later on in the same place on black elder I found *L. lineola* abundant. It is evidently addicted to black elder, and partial to moist woodlands.

As June drew to its close we extended our search to the south slope of a long ridge of high land, some 6 miles north of P. H. On this slope grew the New Jersey tea, and as there were many groves of standing timber, as well as berry patches and thickets of small trees and shrubs, we felt confident that we should make some finds. Our first visit to this place (which we dubbed "the Rocky Mountains") found the New Jersey tea still some days short of blossoming, but there was dogwood in bloom on the slopes, and almost the first bush we visited brought us three or four new beetles, among them *Gaurotes cyanipennis*, of the Lepturoid group, a stout, robust beetle, resembling in form *Pachyta monticola*, very handsome and of a brilliant dark green hue, and *L. capitata*, a beetle we at first took for *ruficollis*, but more tapering in outline, and with head crimson as well as thorax.

With the first days of July, along the southern slope of our local Rocky Mountains the New Jersey tea and late elder expanded to the sun, and the whole hillside became a revel of insect life. The delicate fragrance of the New Jersey tea would no doubt at any time attract guests to its dainty white clusters, but coming, as its blossoms do, jump with the height of insect activity, and in the most glorious weather of the year, the sun blazing through a breathless atmosphere, the number and variety of guests swarming to the feast were almost beyond belief. Sometimes an altercation would arise, when some blundering glutton (like *Bombus* or *Trichius*) tried to elbow his way into a blossom where there was no longer standing room. But "with them," as Wordsworth points out, "no strife can last."

> "For why?—because the good old rule
> Sufficeth them—the ancient plan
> That they should get who have the power
> And they should keep who can,"

—and the weakest go to the wall.

Among the many new species we met with in these happy hunting-grounds were several members of the group *Clyti,* between the *Cyllenes* and the *Anaglypti;* of this group we found an occasional specimen of *Xylotrechus colonus,* and a small *Neoclytus,* while *Clytanthus ruricola* was abundant. In the Lepturoid group we took many specimens of a genus we had not found at all before, *Typocerus,* of which we met with three distinct species, one black (*T. lugubris*), one black and yellow, banded like a wasp (*T. sparsus*), and a third mottled with patches of straw-colour and reddish brown (*T. velutinus*).

In midsummer heat, insects seem to grow nervously alert and restless and we found the Typocerus often defied capture; they would hover at a blossom without settling, like miniature humming birds, their tiny wings fanning with marvellous velocity, while their flight from one point to another was of the swiftest. A small beetle in flight is never conspicuous, and some of them when they settle on a blossom seem to have stepped out of the infinite, and when they take to flight again they pass away into a 4th dimension, as though, like Wordsworth's skylark, they too enjoyed a "privacy of glorious light," but one that needed no soaring to gain. More than once we found with birds of this feather that one in the hand was by no means worth two in the bush; there proved many a slip between the cup of one's closed fist and the lip of the cyanide bottle.

To the Lepturas themselves, already a long list, we added *L. subhamata, zebra, vagans, proxima, biforis, vittata, Canadensis,* and three species at least unidentified. Of these, *proxima* and *subhamata* seem to prefer the elder, and *Canadensis* the milkweed. In the same neighbourhood, from the heart of a dogrose I flushed an *Oberea bimaculata,* and from plants of the wild bergamot, with its sweet fragrance and delicate lavender blossoms, a whole covey of some smaller *Oberea* that I have not yet identified. I say "flushed" advisedly, for in the first instance I did not bag my bird; indeed, I chased it for two years before I caught it (the species, that is, not the individual). It is a small insect, of very narrow outline and black in colour; when flying it is almost invisible, only the practised eye can make out a minute and swiftly-moving shadow. You will get some idea of the hunter's difficulties when I say that I found it fatal to wink the eye while marking its flight; the creature simply disappeared like the skylark at the last point of vision. For one thing, it has a dodging flight, like that of a snipe, and to make its assurance of escape doubly sure it never settles on the upper side of a leaf, but always underneath. Even then it is seldom off its guard; if you cast so much as a shadow, it is off like a trout in a pool. I tell you there was rejoicing in the camp, if not feasting, when I came home with the scalp of *Oberea bimaculata* at my belt.

But in so fair a scene as the Port Hope "Rocky Mountains," disappointments cast but a passing shadow. The place was a perfect Paradise of flowers, and as we wandered in sunshine beneath the vaulted blue, over beds of New Jersey tea, through thickets of raspberry and thimbleberry, among brackens and orange lilies, by fences festooned with grapevine and smothered in dogrose, everywhere a riot of blossom and insect life. Nature transfigured with the glory of the July sun, we thought of the wonderful interdependence of all living things on earth, and felt—I hope I may say it without irreverance—that it was good to be there.

> "Such life there, through such lengths of hours,
> Such miracles performed in play,
> Such primal naked forms of flowers,
> Such letting Nature have her way,
> While Heaven looks from its towers!"

EVENING SESSION.—THURSDAY, NOVEMBER 4.

At 8 o'clock p.m., a public meeting was held in the Massey Hall auditorium, which was well filled with students, both male and female, and a number of visitors from the town as well as members of the Society. The chair was taken by Dr. Bethune, Professor of Entomology. The proceedings were much enlivened by musical selections excellently rendered by the College Orchestra under the direction of Mr. J. D. Tothill, fourth year student in Biology, and a piano solo by Mr. Roy Fraser, another student in the same department.

After a few remarks by the Chairman on the origin and progress of the Society which was celebrating its forty-sixth anniversary and the near approach of its jubilee, he introduced the speaker of the evening, Dr. C. Gordon Hewitt, the newly appointed Dominion Entomologist, who was taking up the work at the Experimental Farms so long and so ably conducted by their lamented friend, the late Dr. James Fletcher. It was a great pleasure to welcome Dr. Hewitt to Canada, and to have his kindly assistance during the proceedings of the annual meeting of the Entomological Society.

HOUSE-FLIES AND THEIR ALLIES.

Being the major portion of a lecture delivered before the Entomological Society of Ontario, on November 4th, 1909, by C. Gordon Hewitt, D.Sc., F.E.S., Dominion Entomologist, Ottawa.

It is an especial pleasure to me to have this opportunity which the Entomologists of Canada, in inviting me to give this address, have afforded me, of addressing my first remarks in public in Canada to the Entomological Society and the students of the Ontario Agricultural College and the Macdonald Institute. It is, in a sense, my official introduction to you, and the cordial reception which I have been accorded on all sides, and especially during the meeting, have been most encouraging, and I can only say in reply to it all that while I have the honour to be Dominion Entomologist it will be ever my object to further the science of entomology, especially Canadian entomology, and by the application of the results of scientific research to deal with those varied problems, both great and small, which confront the entomologist when dealing with injurious insects and their control.

The subject of my address this evening is one that is familiar to you all. In Canada I find you know the house-fly only too well. It is man's most constant companion and the most truly "domestic" animal in the world. Wherever man has gone the house-fly has followed in his steps, from the arctic circle to the burning tropics it dances in constant attendance, the uninvited guest. And yet, in spite of all this, notwithstanding the fact that no living creature paid him so much attention, he did not trouble himself about it beyond a most cursory inquiry into its habits and life. This is not infrequently the case in zoological science; we write monographs of inordinate length on species of animals whose chief recommendation is that they are rare, whereas on the other hand, those animals, frequently of great interest and importance, that are waiting on the threshold of our laboratories for inquiry are passed over. The house-fly is one of the greatest examples of this. In 1790, Keller made an excellent study of the "Stubenfliege;" he studied the life-history and anatomy and anyone who has seen the beautiful memoir which he wrote and the charming illustrations will be filled with admiration and wonder that so much could have been done with the scientific apparatus then at the investigator's disposal. Previously and subsequently to that, those great naturalists, Reaumur, DeGeer and Bouche, all included a short description of this insect and its habits in their classic works. Since that time the only investigators who contributed really valuable information have been Packard and Howard, who have studied the life-history and habits in the United States. There is no need for me to call the attention of Canadian entomologists to the great importance of Dr. Howard's work, the value of which lies in the fact that he, above all investigators, showed the people of the United States, and of other countries too, the serious rôle which the house-fly plays in our national life. I need only refer to the excellent work which is being done by the New York Merchants' Association to combat this danger from flies—than which such an association could do no work more worthy—as an illustration of the manner in which a corporation has taken the warnings, has proved them beyond dispute for itself and is applying the results of such knowledge as it has gained to the amelioration of public life.

It has been my good fortune during the past few years to be able to add a little to our knowledge of this insect by a detailed study of its anatomy of which we had no previous account, and its life-history and habits. The result of that work has now been finished, though like most investigations it is not complete and it is my intention to-night to give you briefly and in a popular manner some of the results of my work and of the work of others who have been studying the habits of this insect.

First of all, you must understand that several species of flies inhabit houses, some of these are frequently mistaken for the true house-fly (*Musca domestica*). This species is easily recognizable by having on the dorsal side of the thorax four almost black longitudinal stripes on a dusty grey ground which in certain lights has a golden shimmer; the ground colour of the abdomen is a buff yellow and there is a dark brown median dorsal stripe; the whole of the dorsal side of the abdomen, however, is overspread with a reflecting grey which gives it a blotchy appearance. The average size of this species is 6-7 mm., but unfavourable conditions in the larval life tend to produce dwarf specimens of the adults. The occurrence of these smaller specimens was no doubt partially responsible for the popular idea that they were *young* house-flies and this in turn led to the mistake that many non-etomological people make in believing the other species of fly which occurs in houses, namely, *Homalomyia canicularis*, to be a young *M. domestica*. This lesser house-fly differs on examination very considerably from *M. domestica*. In the venation of the wings the fourth longitudinal vein of the wing of *H. canicularis* goes straight to the margin as in all the members of the group *Anthomyidæ*, whereas in *M. domestica* it is bent up at an angle before reaching the margin which it joins close to the termination of the third longitudinal vein; not only is it smaller, but in form and colouration *H. canicularis* differs from *M. domestica.* The dorsal surface of the thorax of the male is greyish black with three indistinct longitudinal stripes, the male's abdomen is slender and tapering compared with that of *M. domestica;* it is bronze black with three or four pairs of translucent yellow lateral areas. The body of the female is coloured a dark ash-grey and the thoracic stripes are more distinct, the abdomen shorter and more robust.

Musca domestica forms by far the major portion of the fly population. Howard's, Hamer's and my own observations show that the percentage is usually 90-98 per cent. of the total fly population.

Another fly that sometimes occurs in houses, especially country houses in the fall, and also in the spring in England, and whose habits have frequently led to the popular erroneous idea as to the ability of the house-flies to bite, is the blood-sucking *Stomoxys calcitrans,* known by various popular names such as Storm-fly, Stable-fly, Fall-fly, all of which names are equally inapplicable to one species. It can readily be distinguished from *M. domestica* by the sharp awl-like piercing proboscis which projects forward horizontally from beneath the head. This type of proboscis enables it to pierce the skin of animals and thereby suck the blood of the same. It is interesting to note in passing that *S. calcitrans* is allied to those tropical blood-sucking Diptera of the different species of Glossinas, which are responsible for the deadly disease of sleeping sickness and Nagana. They carry the Trypanosomes, the organisms which cause the diseases, and by their blood-sucking habits infect man and other animals. The former disease has reduced in a few years the population of Uganda by two-thirds and Nagana has rendered central and sub-tropical Africa practically impassable to horses.

Musca domestica possesses a proboscis that is quite incapable of piercing the skin. It is only of use in absorbing fluids and this process of absorption is one of great interest. The proboscis is extended in the following manner. The vacant spaces in the head are filled with capacious air-sacs and blood; by the inflation of these air-sacs of the head the blood is driven into the cavity of the proboscis which is thereby extended and the two lobes which form the oral disc are distended by means of the blood. These oral lobes are traversed on their inner sides by a very large number of channels which are kept open by minute rings open at one side—and owing to their tracheal appearance are called pseudotracheæ. The oral surface is applied to the fluid-moistened surface and by capillary action and the pulsating movement of the oral lobes the fluid runs along the pseudotracheæ into the oval pit and thence into the pumping pharynx—the pumping action of the latter keeping up the constant inward flow of the solution. In the case of such solid food as sugar this is first rendered soluble by the secretion of the lingual or salivary glands. The surface of the oral lobes is kept in a moist condition by the secretion of a small pair of labial glands.

If the abdomen of a mature female fly is opened it will be found that it is almost filled by the enormously distended ovaries; the alimentary tract occupying a small trough-like cavity between them and the dorsal region. In the posterior region of the abdomen the ovipositor will be seen usually in a retracted telescopic condition. When exserted the ovipositor is about equal in length to the abdomen and the female fly is thus enabled to deposit her eggs deep down out of the light in the crevices of whatever substance, decaying vegetable or excremental, it may have chosen as a nidus for the larvæ. About 120 to 150 eggs become mature at the same time and these are deposited in clumps, as many as sixty or seventy may be found packed together in one clump. The eggs are pearly white in colour, marked with very fine sculpturing; they are 1 mm. in size, slender and cylindrically oval, one end being more pointed than the other and along the dorsal side of the egg there are two curved rib-like thickenings of the chorion. The eggs of *M. domestica* have not the appearance of the grooved wheat grain as stated by several writers. It has been found that horse manure is the special breeding place of flies, but they will deposit their eggs and the larvæ are able to feed on almost any kind of excremental products and in decaying vegetable substances such as kitchen refuse, especially if such substances are in a fermenting condition. They will also deposit their eggs in decaying fruit and certain food stuffs such as moistened bread, egg, broth, etc. The most important factor which governs the development of the larvæ is temperature; a high temperature accelerates the development. It is also affected by moisture, diminution in the amount of moisture retards development and by the character of the larval food and fermentation. The shortest time which I was able to obtain for the development of *M. domestica* was eight days. This was obtained by keeping the larvæ at a constant temperature of 35 degrees C., and the times occupied in the different stages were as follows:—egg from deposition to hatching, 8 hours; whole larval or "maggot" stage 5 days; the larvæ moult twice and the times occupied in the three larval stages were 24 hours, 24 hours and three days respectively; the pupal stage lasted three days. These times are probably as short as will be found usually under natural conditions. Under unfavourable conditions, with regard to temperature, moisture, etc., the development has been found to extend over several weeks. In no case, however, was it found possible to keep the insects in the pupal stage during the winter nor do I know of any other observer who was able to do so. They invariably pass the winter as adult flies, and under suitable conditions of temperature and the presence of larval food, are able to breed during the winter months. The newly hatched larva measures 2 mm. in length and the average length of the adult larva is 12 mm. It is a typical, conically cylindrical, muscid larva, or "maggot," consisting of thirteen segments. It progresses by means of seven pairs of locomotary pads on the ventral side of the body and these are covered with small spines. The intestine of the full-grown larva is very complicated as will be seen from the figure thrown on the screen. When the larva is full-grown it retracts the anterior and posterior ends to form a barrel-shaped pupal stage lasted three days. These times are probably as short as will be found from a creamy yellow to a dark chestnut brown. When the fully developed fly emerges from the pupal case it pushes off the front end of the case in two sections by means of an inflated sac in front of the head; this sac is afterwards withdrawn into the head. After emerging from the pupal case the fly crawls about until its wings have attained their permanent form and the body has hardened and dried. In my experiments I found that the flies became sexually mature in ten to fourteen days after their emergence from the pupal state, and four days after coitus with the male they began to lay their eggs which was possible therefore from fourteen days after emergence from the pupæ. It will be seen from actual observations and experiments that in hot weather the progeny of a fly may be laying eggs in about 3 weeks from the time the eggs from which they were hatched were deposited, and as a fly may deposit about six hatches of eggs in a single season, it is not difficult to realize the millions of flies which a few flies may produce in the hot summer months. These observations indicate two important points: first, the necessity of destroying the *first* flies that appear in the season, and secondly, the abolition of their breeding places. In our towns and cities owners of stables should be compelled to either remove collections of manure within seven days or to treat the manure with such a substance as chloride of lime or mineral oil as each lot is thrown on the heap to prevent the breeding of the flies and such manure should be kept in a chamber to which flies cannot obtain access. The first method is the best and most effectual and certain cities have now by-laws enforcing such periodic removal of manure. All cities and towns should enforce such removal or treatment, nor should they allow the accumulation of rubbish and substances on which flies can breed as many local authorities are accustomed to do. It is invariably found in such cases that the maximum number of cases of zymotic diseases such as typhoid and epidemic diarrhœa are located around such places. The change of attitude of people towards house-flies during the last few years has been remarkable. Public opinion on such subjects is slow in changing and although we had known for years from the work of Celli, Nuttall, Hoffman and many others that flies were in the habit of carrying the bacilli which cause certain of our infectious diseases such as typhoid fever, ophthalmia, tuberculosis, etc., it was not until medical men as a whole began to realize the important rôle that house-flies play in the dissemination of these diseases that we really began to move. But now there are fortunately few who do not realize the danger of the house-fly. What could be more probable than the transference of disease-carrying bacilli by flies when they have access to the dejecta of incipient or carrier cases of typhoid on the one hand and food materials on the other. Several observers during recent campaigns and also in military camps in time of peace have observed flies frequenting the food in the mess tents and carrying on their bristle-covered legs the white disinfectant from the camp latrines. Such an observation is sufficient to convince the most obstinate sceptic as the relation that flies may have in the transference of disease germs. Take, for instance, the flies in unsanitary localities; they are accustomed to frequent every kind of filth in the way of kitchen refuse and excremental substances and to spend a portion of their time regaling their palates with the food stuffs in the houses, especially such articles of food as sugar and milk. It has been proved that milk to which flies have had access becomes seriously contaminated with and infected by the bacilli which the flies have obtained from filth of different kinds and milk is an excellent medium for the growth of bacilli, especially during warm and hot weather.

What are the methods, then, which we have of combating this most serious menace, for, to my mind, the fly problem in our cities is far more important than the mosquito problem towards the solution of which thousands of dollars are spent annually—and compared with which the suppression of the fly danger is indeed as simple. They are these. First, the abolition of their breeding places; the removal within seven days in the summer, of collections of horse manure, decaying and fermenting vegetable substances on which the flies can breed. The substitution of the more sanitary system of sewage disposal by water instead of the older and generally insanitary and dangerous methods of conservancy. The protection of collections of manure or kitchen refuse; keep the lid on the refuse chamber. Do not allow flies to have access to food, especially such foods as milk, sugar, etc., but, where flies occur, keep all such food covered with a muslin covering. Farmers and dairymen should not leave milk about exposed and accessible to flies. A man would not be willing that flies should have access to a glass of milk intended for his own consumption, and why should he leave milk exposed in pails in cow-sheds and similar places where the flies have a maximum opportunity of covering their legs and bodies with bacilli of all kinds, especially putrefactive bacilli. "Prevention is better than cure" is almost a truism, but the welfare of the future will depend almost entirely on that one word, Prevention. Nature is yielding up her secrets one by one through the toil of men of science, and it is by the application of the knowledge thus gained that we shall be able to avoid that great rod of chastisement of Nature, disease, which is inflicted on those who disobey or transgress her unwritten laws.

And while we have these insects arrayed against us there are others allied to them which, by assisting in the maintenance of a balance in nature take up their position on our side. These are the Tachinid flies, many of which, to the casual observer, have a superficial resemblance to the house-fly. There are a very large number of species of Tachinidæ and considerable variation in size and structural characters. The larvæ of most of them are parasitic on lepidopterous larvæ, and in certain cases these parasites increase to so great an extent that they may suppress completely an exceptional increase of caterpillars. It is largely owing to these parasites and the Ichneumons that our vegetation is not completely eaten up by lepidopterous larvæ. The Tachinid maggot feeds inside the caterpillar and gradually destroys the tissues of the host. In some cases the maggot leaves the caterpillar before it pupates, in other cases the caterpillar pupates and the Tachinid maggot pupates inside the cocoon or pupal cell. Their life-histories are extremely diverse and this is frequently found to be the case in the life-histories of the members of a group of animals which has assumed parasitic habits, whether it be insects, crustacea or more lowly organisms. Parasitism induces profound changes in the life-history of animals, and we find great variations in so small, comparatively, a group as the Tachinidæ. Whereas some of the insects deposit their eggs upon the skin of the caterpillars, from which position on hatching the larvæ bore into the interior of the host; others deposit their eggs upon the leaves of the plant as, I believe, is the case in *Ugimyia sericaria,* Rond, which is the cause of the most serious "Ugi" disease of the Japanese silkworms. The caterpillars, on feeding on the leaves, take the eggs in biting off the portions of leaf to which they are attached, into their digestive tracts where the maggots emerge and bore through into the tissues of the body. A third class is exemplified by the species *Eupeleteria magnicornis,* Zett, which, as Townsend has shown, deposits living maggots not on the caterpillars, but upon the green shoots, leafribs, etc., on which caterpillars were present and usually on the silken thread spun by the caterpillar on its trail over the plant. It will be recognized that the first method is the one in which the maggot is least sure of success in entering the host, for it not infrequently happens that the caterpillar moults before the eggs of the Tachinid hatch and thus rids itself of the danger. So that although we may find Tachinids depositing their eggs freely upon caterpillars, it is unsafe to predict beneficial results. Howard, for example, mentions a case in which 226 moths and only four Tachinid flies were obtained from 235 caterpillars of the Gipsy Moth, upon each of which 1 to 33 Tachinid eggs had been observed. In another case, 252 caterpillars, all bearing Tachinid eggs, were reared and not a single fly emerged. These cases illustrate well the advantage to an insect larvæ of such a method of growth by the moulting of the old skin. Once inside the caterpillar the maggot bores its way into the body cavity or blood cavity and immediately attaches the breathing pores at the posterior end of its body to one of the breathing pores of spiracles of its host and thus obtains its air direct from the outside. In this position it remains during the whole of its larval life, until it is full grown. It moults twice and the old skins remain attached at the posterior end of the body as the maggot does not leave the spiracle of the caterpillar to which it has once attached itself, until it finally leaves it to pupate.

Allied to these insects are the Anthomyidæ, some of whose larvæ are the destructive root-maggots, which feed on the roots of many vegetables, such as cabbages, radishes, onions, beans, etc. A few years ago I found, when studying the life-history of *Musca domestica,* that the flies of the root-maggot (*Anthomyia radicum,* Meigen), were especially fond of laying their eggs on horse manure in which the larvæ were reared. This fact may account frequently for the presence of root maggots on crops, as it has been found that fields heavily manured suffer more from the attacks of root maggots than those on which there is less manure or which have been manured some length of time. Such facts as these have to be borne in mind in cultivating infested areas.

These few cases of the economy of certain allied insects will illustrate to you the benefits and injuries that are the result of different modes of life of insects somewhat closely allied and show how the knowledge gained from a careful study of the life-histories and habits of life or bionomics can be applied to further the welfare of man.

At the close of Dr. Hewitt's lecture, which was illustrated by a number of beautiful lantern slides of the life stages of various species of flies and of their structural and anatomical details (Plate F, page 141), a hearty vote of thanks was given him. President Creelman, in proposing the vote, and Professor McCready, in seconding it, spoke in high terms of the excellence of the address and the gratification that all felt in the appointment of so well qualified a successor to the late Dr. Fletcher.

The chairman referred to the measures that had been put in operation for reducing the number of disease-bearing flies in the city of New York, and the encouraging diminution in the percentage of cases of sickness and death during the later months of summer, especially amongst children. The meeting was brought to a close with a musical performance by the orchestra and the singing of "God Save the King."

SECOND DAY'S SESSION—FRIDAY, NOVEMBER 5TH, 1909.

The President, Mr. TENNYSON D. JARVIS, took the chair at 9.30 a.m., in the Biological lecture-room of the Ontario Agricultural College. There was a good attendance both morning and afternoon, including many of the students as well as members of the Society. The first order of the day was the reading of the reports of the Council, the Branches at Montreal and Toronto, and of the different officers of the Society. The Montreal Branch was represented by Mr. A. F. Winn, and Toronto by Mr. J. B. Williams. The report of the Delegate to the Royal Society was read by Mr. A. Gibson, of Ottawa. This was followed by the election of officers for the ensuing year, 1909-1910 (see page 6).

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present the report for the year 1908-09.

The forty-fifth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on the 5th and 6th of November, 1908. There was a very satisfactory attendance of members from a distance as well as those locally resident; a considerable number of the students of the College were also present.

The first afternoon was occupied with the reading of the reports of the Directors on the insects of note in their respective districts, and a conference was held on the chief insect pests of the season, which was participated in by many of those present. In the evening a public meeting was held in Massey Hall, and a popular lecture was delivered by Dr. E. P. Felt, of Albany, State Entomologist of New York, on "The Interpretation of Nature," illustrated by lantern pictures. A paper was also read by Prof. Lochhead, of the Macdonald College, St. Anne de Bellevue, P.Q., on "Entomology in the Graduate School of Agriculture at Cornell University."

The morning and afternoon of the second day were occupied with the reading of the reports of the various branches and officers of the Society. Papers were also read on a variety of subjects, both scientific and practical. All of these have been published in the annual volume. This volume, the "Thirty-ninth Annual Report to the Legislature of Ontario," was published in March last, and contained 152 pages and 18 half-tone plates of gall insects, also a portrait of the late Dr. James Fletcher. The papers were further illustrated by over 40 figures in the text. Besides those already mentioned, it included the following articles: "What Entomology the Farmer and Fruitgrower should know," "The Strawberry Weevil," and "Injurious Insects of Quebec in 1908," by Prof. Lochhead; "A Catalogue of the Gall Insects of Ontario," "Apparatus for Collecting small Arthropods," and "Notes on the Coccidæ of Ontario," by Mr. T. D. Jarvis, President of the Society. Among the popular papers were, "Beetle Haunts," by F. J. A. Morris; "A Farmer's Wood Lot," by Dr. Fyles; "The Importation of Parasites of the Gypsy and Brown-tail Moths," by Dr. L. O. Howard, Chief of the Bureau of Entomology, Washington. The remaining papers were of a more or less scientific character, viz: "Hydrœcia Micacea in Canada," and "The Entomological Record," by Mr. Arthur Gibson; "The Life History of Euchætias Oregonensis," by Mr. H. H. Lyman; "Observations on the Sorghum Midge," by Mr. R. C. Treherne; "Enemies of Ontario Coccidæ," by Mr. A. Eastham; "Two Butterflies added to the Montreal List," by Mr. A. F. Winn; "Collecting with a Lantern Trap," and "Notes on Lachnosternas," by Mr. J. D. Evans; "The Tussock Moth in Toronto," by Mr. P. Hahn; "The Economic Importance and Food Habits of American Gall Midges," by Dr. E. P. Felt; "Injurious Insects of the Year," by Dr. Bethune and Mr. Gibson.

A few days after the close of the meeting the members of the Society and a host of friends all over the continent were shocked and deeply grieved at the sad tidings that our much loved President, Dr. James Fletcher, was no more. His death took place at Montreal, on Sunday, November 8th, 1908, after an operation from which he had not the strength to rally. A great man, a master mind, an enthusiastic student of nature, a most lovable personality has been taken from us. In our last report a full obituary notice was given. It is therefore unnecessary to enter into any further account of the work of our lamented friend.

"The Canadian Entomologist," the monthly magazine of the Society, has been regularly issued at the beginning of each month. The fortieth volume was completed in December last, and eleven numbers of the forty-first volume have already been published. The volume for 1908 consisted of 471 pages, and was illustrated by 11 full-page plates and 20 figures from original drawings. The contributors numbered 69 and included writers from Ontario, Quebec, Manitoba, Alberta, British Columbia, England, the United States, Brazil, Norway, and the Hawaiian Islands. The articles are, as usual, largely of a scientific character, and contain much highly valuable matter. No less than 33 new genera were described, 282 new species and 9 varieties or subspecies of insects belonging to various orders.

The reports from the branches of the Society, at Montreal, Quebec, and Toronto, are highly satisfactory, meetings having been regularly held and many papers read and discussed. Owing to the absence of the Secretary in England no report was received from the British Columbia Branch.

Meetings of the Society were held from October to March at the Ontario Agricultural College, Guelph, on alternate Wednesday evenings. The attendance included a number of the more advanced students and a gratifying amount of interest was shown by all who attended. The following papers were read during the season: "The Sorghum Midge in Louisiana," by R. C. Treherne (4th year student); "A Classification of Muscoidean Flies," by W. R. Thompson (4th year student); "Rearing Pomace Flies," by E. W. Stafford (4th year student); "Suggestions for Field Inspection," by R. C. Treherne (4th year student); "Notes on Eriophydæ," by J. Tothill (3rd year student); "Memoir of the late Dr. Fletcher," by Dr. C. J. S. Bethune (Professor of Entomology); "Some Notes on Mites," by T. D. Jarvis (Lecturer in Entomology); "The Chalcidid Subfamily Encyrtineæ," by Alfred Eastham (4th year student); "Remarks on the External Anatomy of Chalcids," by A. C. Baker (2nd year student); "The Genus Tetranychus," by R. C. Treherne; "The Entomological Department at Macdonald College," by A. G. Cutler (4th year student); "Spiders," by Dr. C. J. S. Bethune; "Injurious Insects of the Season," by L. Caesar (Demonstrator in Entomology).

It is with deep regret that the Council have to record the death of Dr. William Brodie, of Toronto, who died on the 6th of August last, in his seventy-eighth year. He had recently been contributing a series of papers on Gall insects to the pages of the "Canadian Entomologist," and was occupied with the duty of looking after the collections in the Museum of the Department of Education. One of the oldest honorary members of the Society, Mr. William H. Edwards, died in the early part of the year. He had been one of the most regular contributors to the pages of the "Canadian Entomologist" during a long series of years and was known to the scientific world as the author of three most beautifully illustrated volumes on "The Butterflies of North America." We have also to deplore the loss of another contributor in the person of Prof. M. V. Slingerland, of Cornell University. Obituary notices of these gentlemen have already been published in the pages of the "Canadian Entomologist."

Efforts are now being made to hold an International Congress of Entomologists at Brussels, in August of next year. A large Committee has been formed to represent the Dominion of Canada, including members of our Society in all the different provinces. It is much to be hoped that we may be represented by one or more delegates, and that the forthoming meeting may be a precursor of a long series in years to come.

It is with much regret that the Council has learned that the Rev. Dr. Fyles, for so many years the active President of the Quebec Branch, has resigned his position as Chaplain to the Immigrants and removed to Hull, P.Q. The rest and retirement which he has so well earned by many years of laborious work will, it is hoped, be long enjoyed by this veteran entomologist. Mr. A. R. M. Boulton has been elected President of the Quebec Branch, which will, no doubt, continue as active and enthusiastic as heretofore.

The Council has great pleasure in welcoming Dr. C. Gordon Hewitt, the newly-appointed Dominion Entomologist for the Experimental Farms. It is a great satisfaction to know that we have a successor to the late Dr. Fletcher who has had a thorough scientific training and is evidently quite competent to take up and continue the work of his illustrious predecessor. The country is to be congratulated on the acquisition of so able a man and it is trusted that he will long continue to work out and develop the various phases of economic and systematic entomology which will devolve upon him. We welcome him most cordially also to the ranks of our Society.

Respectfully submitted,

TENNYSON D. JARVIS,
President.

REPORT OF THE MONTREAL BRANCH.

The 302nd regular, and 36th annual meeting of the Montreal Branch was held at 74 McTavish Street on May 8th, 1909.

The members present were: Messrs. Geo. A. Moore, in the chair; Henry H. Lyman, G. Chagon, G. A. Southee, E. C. Barwick, A. E. Norris, L. Gibb, F. Parkins, Jr., W. G. Gerth, A. M. Delisle, A. F. Winn.

The minutes of the April meeting and last annual meeting were read and confirmed.

St. Hilaire was selected as the locality for Victoria Day outing.

The Secretary read the following

REPORT OF THE COUNCIL.

During the season eight regular meetings have been held, the average attendance being eight members. Six new names have been added to the roll, and it is hoped that after the collecting season that they will help make our meetings interesting by bringing specimens of their captures as well as notes and queries on certain species.

At the beginning of the present year, the Mount Royal Entomological Club was amalgamated with our Society, their books, pamphlets and funds being handed over to us. To take the place of part of the work of the late club, it was decided to hold informal meetings between the regular dates or during the summer. Two of these meetings have been held; one in January was devoted to examining the collection of lepidoptera of the Secretary; the other in April at Mr. Barwick's, at which he showed his new cabinet and collection, and microscopic slides of insects were exhibited under three of the members' instruments.

The following is a list of the papers read:

Annual Address of President, Geo. A. Moore.
A Supposed Addition to Montreal Lists (Incisalia Henrici), Henry H. Lyman.
More Recollections, H. F. Winn.
Captures of Hemiptera at St. Hilaire, May 24, Geo. A. Moore.
"Go to the Ant, thou Sluggard," Henry H. Lyman.
Two Additions to the List of Montreal Butterflies, A. F. Winn.
Note on Junonia Cœnia in Maine, A. F. Winn.
On Water-Striders, Geo. A. Moore.
Respiration in Caterpillars, Henry H. Lyman.
A Trip to Gardiner, Maine, A. F. Winn.
A Small Collection of Insects from the Yukon, G. Chagnon.
The Genus Triphleps (Hemiptera), G. A. Moore.
Notes on a few Butterflies from the Yukon, Henry H. Lyman.
Notes on Hepialidæ, A. F. Winn.
Unnamed Capsidæ, Geo. A. Moore.

Pseudohazis Shastaensis, A. F. Winn.
The Shores of Ponds and Creeks as Collecting Grounds, G. Chagnon.
Note on Capture of Colias Philodice, var. Luteitincta, A. F. Winn.
A Card-Index Chart for Life Histories of Insects, A. F. Winn.
Butterfly Collecting in Manitoba (selected), Capt. J. G. Boulton, Quebec.
On Spittle-Insects, Geo. A. Moore.
Remarks on Prof. Poulton's Paper on Mimetic Species of Limenitis, Henry H. Lyman.
Structural Characters of Our Species of Agrilus, G. Chagnon.
On Luck, A. F. Winn.

The report of the Treasurer shows a balance on hand of $72.86. The incoming Council are reminded of one or two matters not yet finished, viz., the selection and purchase of a suitable bookplate, the completion of bound sets of the *Canadian Entomologist* for our library, as well as the arrangement of outings for the summer and a programme for winter months.

Respectfully submitted.

(Signed) GEO. A. MOORE, *President*.

The President read the annual address, after which the election of officers was proceeded with, resulting as follows:

President, Henry H. Lyman; Vice-President, G. A. Southee; Secretary-Treasurer, A. F. Winn; Librarian and Curator, L. Gibb; Council, G. Chagnon, G. A. Moore, E. C. Barwick, F. Parkins, Jr.

Mr. Lyman read a paper, entitled, "A Spring Outing," describing a trip to Washington, D.C., and other places, made about April, 1908, illustrating his remarks by specimens of Lepidoptera and pressed plants.

The meeting then adjourned.

(Signed) A. F. WINN, *Secretary*.

REPORT OF TORONTO BRANCH OF ENTOMOLOGICAL SOCIETY FOR 1908-1909.

The thirteenth annual meeting of the Society was held on Thursday, June 10th, 1909, in the Provincial Museum, St. James' Square.

The President, Dr. Brodie, was in the chair, and the following members were present: Miss Blackmore, Mr. Smith, Mr. Miller, Mr. Williams, Mr. Cosens, Mr. Laing and Dr. Abbott.

The following officers were elected for 1909-1910:

President—Dr. Brodie.
Vice-President—Dr. E. M. Walker.
Secretary-Treasurer—Mr. J. M. Laing.
Librarian—Mr. J. B. Williams.
Curator—Mr. J. M. Laing.
Council—Mr. S. T. Wood, Mr. A. Cosens, Mr. T. J. Ivey and Dr. A. R. Abbott.

During the past year meetings were held with an average attendance of eight members. The Society held an excursion to Niagara Glen, which proved both profitable and enjoyable

The membership of the Society is now twenty-seven. During the past winter the tussock-moth and galls have received much attention, as the list of papers appended will show.

The Librarian reports that publications have been received from the Entomological Bureau at Washington, from the Ohio and Connecticut Experiment Stations, and from the New York State Museum; and, as in former years, the Society have subscribed for a copy of the *Entomological News.*

The Treasurer's report shows the finances to be in a satisfactory condition with a balance in hand of $1.35.

Respectfully submitted,

J. M. LAING, *Secretary-Treasurer.*

LIST OF PAPERS READ: Galls, Dr. Brodie; The Tussock Moth, Dr. Brodie; Collecting in England, Mr. Williams; Galls, Dr. Brodie; Characteristics of the Order Orthoptera, Dr. Walker; Insect Mimicry and Evolution, Dr. Brodie; Ferns, Mr. Ivey; The Tussock Moth, Dr. Brodie.

TREASURER'S REPORT.

Receipts.

Balance from 1907-1908	$779 74
Late Treasurer to March 16, 1908	89 25
Back numbers	181 50
Annual Reports	19 25
Refund of salary	33 00
Advertising	12 48
Members' fees	397 62
Interest	7 40
Printing extras	26 70
Supplies, pins, etc.	134 40
Expense: sale of cash-book and case	7 50
Government grant—10 months..	666 00
	$2,354 84

Expenditures.

Late Treasurer's Exp., Nov. 16, 1909	$37 68
Printing	1,328 64
Annual Report	111 00
Salaries	200 00
Expenses, Postage, etc..........	62 60
Annual Meeting	80 81
Exchange on checks	5 10
Library books and binding	41 51
Supplies, pins, etc.............	114 44
Balance	373 06
	$2,354 84

J. E. HOWITT, *Treasurer.*

Examined and found correct.

S. B. McCREADY,
J. W. CROW,
Auditors.

REPORT OF THE CURATOR.

The Society's collection during the last year has been increased by the addition of one hundred and eighteen new specimens. Of these, ninety were contributed by Mr. Charles T. Ramsden, Guantanamo, Cuba; twenty-two by Mr. T. Baird, High River, Alberta, and the rest by friends who do not wish their names published. Mr. Ramsden's contribution consisted of eighty-five specimens of Lepidoptera, chiefly butterflies and Spinx moths, one Orthopteron, three Diptera, and one Hymenopteron. These insects being almost solely exotic species have been placed in a case by themselves. All of Mr. Baird's specimens were moths, principally belonging to the Noctuidae. These have been distributed among the different cases according to families and genera. The other insects presented consisted of four rare species of moths and two specimens of a rather rare scale insect.

The Society is greatly indebted to the contributors, especially to Messrs. Ramsden and Baird, for their generosity.

While gifts of Lepidoptera and Coleoptera are always welcome, there is great need of properly named species of Orthoptera, Odonata, Hemiptera, Diptera and Hymenoptera, and specimens of these orders are specially solicited from members or other collectors.

The collection has been thoroughly inspected from time to time and precautions taken to prevent loss from museum pests or from other causes. They are all in good condition and show no signs of deterioration.

Respectfully submitted,

L. CAESAR, *Curator.*

REPORT OF THE LIBRARIAN.

During the year closing September 30, 1909, twenty-nine bound volumes have been added to the library, making the total number on the register exactly two thousand. There are also a very large number of periodicals, pamphlets and bulletins added to the shelves, many of which, it is hoped, will be bound during the next few months. No new book of any very great importance has appeared during the past year. Several parts of Wytsman's "Genera Insectorum" have been purchased and others will be added from time to time. Forty-three volumes have been taken out by members during the year, and the books have been largely used for consultation by students and members of the Society almost daily during the College terms. Recently the work of making a card catalogue has been resumed and will be carried on steadily throughout the winter. It is expected that a complete catalogue both of subjects and authors will be accomplished by the annual meeting next year. This will render the books in the library much more accessible and useful to the members.

Respectfully submitted,

CHARLES J. S. BETHUNE, *Librarian.*

REPORT TO THE ROYAL SOCIETY OF CANADA.

BY ARTHUR GIBSON, DELEGATE, OTTAWA.

I have the honour to report that the Entomological Society of Ontario has had a most successful year during 1908. It was with very great regret, however, that we had to record the death of our beloved friend and president, Dr. James Fletcher, which occurred at the Royal Victoria Hospital, on Sunday morning, November 8th, 1908.

The forty-fifth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 5th and 6th last. An interesting discussion took place at the first session on the chief insect pests of the season. The annual report of the Society which recently appeared contains a full account of the proceedings, with the papers presented at the meeting published in full. This is a report of 152 pages and is one of the most valuable ever published by the Society. Among the papers which are here printed, the following may be mentioned:

The Interpretation of Nature. By E. P. Felt, Albany, N.Y.

The Economic Importance and Food Habits of American Gall Midges. By E. P. Felt, Albany, N.Y.

Observations on the Sorghum Midge. By R. C. Treherne, Ontario Agricultural College, Guelph.

Hydroecia Micacea, Esp. in Canada. By Arthur Gibson, Central Experimental Farm, Ottawa.

Further Notes on the Coccidae of Ontario. By Tennyson D. Jarvis, O. A. College, Guelph.

Some Enemies of Ontario Coccidæ, By J. W. Eastham, Ontario Agricultural College, Guelph.

"Some Beetle Haunts," by an Amateur Botanist. By F. J. A. Morris, Trinity College School, Port Hope.

A Catalogue of the Gall Insects of Ontario. By Tennyson D. Jarvis, O. A. C., Guelph.

Entomological Record, 1908. By James Fletcher and Arthur Gibson.

Insects of the Year 1908 at Ottawa. By Arthur Gibson, C. E. F., Ottawa.

Present Condition of the Work Connected with the Importation of the Foreign Parasites of the Gipsy Moth and Brown-tail Moth. By L. O. Howard, Washington, D.C.

What Entomology the Farmer and Fruit Grower should know. By Wm. Lochhead, Macdonald College, Que.

Injurious Insects in Ontario in 1908. By C. J. S. Bethune, Ontario Agricultural College, Guelph.

Injurious Insects of uebec in 1908. By William Lochhead, Macdonald College, Que.

The Farmer's Wood Lot. By Rev. Thos. W. Fyles, Levis, Que.

Life History of Euchætias Oregonensis, Stretch. By Henry H. Lyman, Montreal.

The Society's branches at Quebec, Montreal, Toronto, Guelph and Vancouver all report a most active year. They have all held regular meetings at which papers have been read and specimens exhibited for discussion. The British Columbian Branch publishes a Quarterly Bulletin, which gives concisely the work of the local members. Valuable notes on captures are included from time to time.

The library of the Society, at its headquarters in Guelph, is continuously growing. During the year ending August 31st, 1908, 49 bound volumes were added to the Library, making the total now on the register 1,971. The books of the Society are consulted almost daily by members and also to a considerable extent by the students of the Ontario Agricultural Society.

Some interesting donations have been made during the year to the Society's collections of insects. These collections are now being gone over and many old specimens have been replaced by fresher examples, bearing fuller particulars as to locality, date of collection, etc.

The *Canadian Entomologist,* under the continued able editorship of the Rev. Prof. C. J. S. Bethune, completed last December its fortieth volume. This is a much larger volume than usual, containing 471 pages. Its articles are of the greatest value to entomologists, in fact it is absolutely necessary for anyone who studies insects to any extent, to subscribe to it. Sixty-nine different entomologists contributed to its pages last year, and a number of full page plates appeared as well as numerous figures in the text. It is impossible here to give a list of the papers published, but the following are some of the more important:

British Columbia Syrphidæ, New Species and Additions to the List. By Raymond C. Osborn, Columbia University, New York.

New Histories and Species in Papaipema (Hydrœcia). By Henry Bird, Rye, N.Y.

Studies in the Genus Incisalia. By John H. Cook, Albany, N.Y.

Notes on the Lepidoptera of Kaslo, B.C., with Descriptions of Seven New Species. By George W. Taylor, Wellington. B.C.

New Species of Colorado Aphididæ, with Notes upon their Life-Habits. By C. P. Gillette, Fort Collins, Colo.

Notes on Noctuidæ. By Sir G. F. Hampson, British Museum, London.

List of Hemiptera taken by W. J. Palmer, about Quinze Lake, Que., in 1907. By E. P. Van Duzee, Buffalo, N.Y.

New Species of Dolerinæ. By Alex. D. MacGillivray, Ithaca, N.Y.

Type and Typical. By Henry H. Lyman, Montreal.

Further Notes on Alberta Lepidoptera. By F. H. Wolley-Dod, Millarville, Alta.

Notes on Tenthredinoidea, with Descriptions of New Species. By S. A. Rohwer, Boulder, Colo.

New Species of Therididæ. By Nathan Banks, East Falls Church, Va.

Notes on the Species of Rhynchagrotis Sm., with Descriptions of New Species. By John B. Smith, New Brunswick, N.J.

Recent Work among the Borers. By Henry H. Lyman, Montreal.,

Remarks on Some New Pselaphidæ. By Thos. L. Casey, Washington, D.C.

Blennocampinæ—Descriptions of New Genera and Species—Synonymical Notes. By Alex. D. Macgillivray, Ithaca, N.Y.

Notes on the Pterophoridæ or Plume-Moths of Southern California, with Descriptions of New Species By Fordyce Grinnell, Jr., Pasadena, Cal.

Some Remarks on the Phylogeny of the Hemiptera-Heteroptera. By G. W. Kirkaldy, Honolulu, Hawaiian Islands.

A Key to the North American Species of Aeshna found North of Mexico. By E. M. Walker, Toronto.

Notes on the Coccinellidæ. By Thos. L. Casey, Washington, D.C.

" Some Beetle Haunts, by an Amateur Botanist. By F. J. A. Morris, Trinity College School, Port Hope, Ont.

ADDRESS OF THE PRESIDENT.

By Tennyson D. Jarvis, Ontario Agricultural College, Guelph.

It is my happy privilege to preside over the present meeting and very thankfully do I accept the position which you have so kindly imposed upon me. I have the peculiar privilege of succeeding the late lamented Dr. Fletcher, whose labours and abilities need no words of praise or encomium from me, as they are so well known and so thoroughly familiar to you all.

Besides the late Dr. Fletcher, who so eminently strove to advance the interests and welfare of this Society, we also most sincerely deplore the loss of the activities in our behalf of the late Dr. Brodie, of Toronto. In the neighbouring States William Ashmead, Prof. Slingerland and W. H. Edwards have departed since our last meeting, and the entomological world suffers an immeasurable loss. The results of their untiring zeal and labours to discover what we might know, and what we should know, of the science of entomology have impressed their effects deeply and indelibly upon the minds and in the hearts of all students of this extensive and intricate science.

In the interests of entomology I must congratulate this Society and the country at large on the arrival of Dr. C. Gordon Hewitt, of England, now active at the Central Experimental Farm at Ottawa, and one whose reputation for good work in scientific and economic Entomology had preceded him to this country. Since the decease of the late Dr. Fletcher the department over which he presided has been divided, the Entomological division being taken charge of by Dr. Hewitt, ably assisted by Mr. Gibson, and the Botanical division by Mr. H. T. Gussow, assisted by Mr. Groh.

I regard with pleasure the many new and effective methods which have arisen and have been adopted during the past few years for the diffusion of the knowledge of the science of Entomology. The work of the agricultural experts attached to High Schools in several counties of Ontario, will give a great stimulus to the study of Entomology. The office of the experts includes the teaching of the science in the high school, the conducting of experiments in farmers' orchards and elsewhere, giving advice on agricultural matters and establishing libraries in each county which will contain work largely devoted to Nature Study. Teachers of high and public schools have taken up the subject with more or less success and their work has been very prolific of good results. Another method, and one which may in course of time be a most powerful one to increase the study of entomology, is the three months' course at the Ontario Agricultural College for Normal School students. Nearly two hundred students have during the past year availed themselves of this opportunity, and the number promises to be largely increased in future years.

There is also the nursery and orchard inspection conducted through the horticultural branch of the Department of Agriculture by which an intimate knowledge of injurious forms of insects is obtained and remedies are applied to prevent their increase and spread through infected fruit or stock. The Natural History Societies, with their publications on Nature Study, their excursions, their periodical meetings where eminent scientists are frequently invited to address the members, and in many other ways, have made great strides forward in obtaining and diffusing the knowledge of insects. Another attractive method for the enlightenment of the farmer, nurseryman and others upon this subject of insects, is found in the bulletins issued from time to time by experimental stations and agricultural colleges, by which the quintessence, as it were, of the subject is brought to easy view within a few pages of reading matter. I must also acknowledge the good work of the *Farmer's Advocate, Canadian Horticulturist,* and the *Weekly Fruitgrower* for their assistance in the diffusion of knowledge and the instruction of their readers. These periodicals merit highly the splendid patronage accorded to them.

From the position which I at present occupy I feel impelled to acknowledge that a large share of the means of disseminating a knowledge of the workings of our Society throughout the world is due to the *Canadian Entomologist,* our monthly magazine edited by Dr. Bethune. This publication has long since attained a position of celebrity in literary and scientific circles for the thorough information it imparts and the high standard of excellence it has attained and achieved.

The graduates from this College in the Department of Biology also deserve to be mentioned as a potent factor in the gathering of facts and diffusing knowledge in this science. Their studious and untiring researches and investigations, the zeal and energy with which they enter into their task, and the interchange of ideas resulting from them have greatly assisted in attaining a thorough knowledge of certain families of insects under all kinds of climatic conditions.

We should not overlook the work of this College and of kindred institutions in the diffusing of the knowledge of Entomology and the stimulus they impart to research. Hundreds of students therein, undergraduates, are during the most favourable season of the year engaged in the gathering of insects and in the study of their life histories, their habits and their workings.

A great deal is done for the spread of information regarding insects by the professors at the Colleges where the science of Entomology forms part of the curriculum, by correspondence with people of various pursuits making inquiries. There have been many hundreds of such enquiries answered during the past year by Dr. Bethune of this College, and his colleagues, and no doubt the same may be said respecting the correspondence in other Colleges of a similar character.

The lectures given by professors and graduates of Agricultural Colleges, and by others who have given the matter thought and study, upon all branches of Nature Study at meetings and gatherings of various kinds, also greatly assist in disseminating in a more or less successful way, the knowledge of this science and the useful application of what we know about insects.

Among some of the latest and best works upon the subject of insects published during the past year may be mentioned "Our Insect Friends and Enemies," by Dr. J. B. Smith; "Insects and other Allied Pests, etc.," by Fred V. Theobald; and "Fruit Trees and Their Enemies," by Spencer W. Pickering.

It is to be regretted that in the cause of research the methods employed are not always calculated to bring about the best possible results. Persons engaged in this work are often too easily contented with the discovery of individual insects and fail to profit by the study of a family group of them. In this regard the pursuit of research should be continued with more and better system and it would be well to inculcate into the minds of all entomologists that this science must be studied, not from individual insects alone, but also from observing the life history, the habits, the qualities and working of whole families. However, the proper methods have been adopted by a number of eminent scientists in this country and the United States as we learn from the reports of their successful researches.

It is to be hoped that the governments of the day will be as generous, or even more so, in giving aid for the benefit of the science of entomology as they have been in the past, so that the work or research and the diffusion of information may not suffer from want of the means to carry them on. When able men, aided by the necessary means, are active, great results may be expected, and with the stimulus of new discoveries constantly before them, there is no fear that we should suffer disappointment; the benefits to our country and its people derived therefrom, will in all probability be equal to, if they do not surpass, any investment of energy and means in other causes.

In closing my remarks I desire to thank you very heartily for your attendance here, for the excellence of your addresses, and the patience and close attention you have exercised during this meeting. If the enthusiasm for the science of entomology which you have displayed during this session is a true exponent of the spirit within you, it augurs well for profitable and successful years to come for the Entomological Society of Ontario.

THE ORIGIN AND DIFFUSION OF ENTOMOLOGICAL ERRORS.

By Henry H. Lyman, Montreal, Que.

Though using the word entomological, I shall confine my remarks to the Lepidoptera as the only order which I have studied, but doubtless similar conditions have given rise to similar errors in the other orders.

Anyone who has looked over many collections of North American Lepidoptera must have been struck by the number of mis-identifications of species, or transpositions of names to be found in them, and an interesting study could be made of the numerous popular errors which have become current in time past, and which in many cases still persist. Indeed, their universality and persistence is quite remarkable and it seems almost hopeless to try to eradicate them.

Their origin can in most cases only be surmised, but their diffusion and persistence can be easily accounted for. In Europe they have always been much better supplied with illustrated works on Entomology than we have been on this continent, and this is easily accounted for. In the first place the science was studied there long before it was here and many North American insects were described by European authors. Then there has always been a much larger number of collectors in Europe than in America, and if many of them have done nothing else to advance the science, their subscriptions have at least rendered possible the issue of well illustrated works, which was also assisted by the much cheaper rate at which such works could be produced in Europe than in America.

The earliest important work devoted to the Lepidoptera of North America was the magnificent work by Abbot and Smith, in two large folio volumes on "The Natural History of the Rarer Lepidopterous Insects of Georgia," which was published in London in 1797, but this was a costly work and only found its way into the more important libraries and to a few wealthy collectors.

Thomas Say, who has been called the Father of American Entomology, wrote between 1818 and his death in 1834, but it was only in 1859 that his complete writings on Entomology were collected by Dr. John L. Leconte, and issued in two volumes. Of the 54 coloured plates, only 12 were devoted to the Lepidoptera, most of the others being given to the Coleoptera. In 1841 appeared the first edition of Dr. Harris' classic work on the "Insects of Massachusetts Injurious to Vegetation," and other editions were issued in 1842 and 1852, and the revised edition by Flint in 1861. But from none of these works could the names of more than a very few of the moths of this continent be learned, and, therefore, collectors were dependent upon the leading authorities in the various branches for the determination of their captures.

As Mr. Grote was the leading authority upon the Noctuidæ, he was probably the one most frequently appealed to for determinations, indeed, he once advertised that as his time was so much taken up with this work he would for the future make a charge for naming specimens, which probably had the effect of materially reducing the applications.

Another who did a great deal of this work was Dr. Herman Strecker, who advertised his readiness to determine material sent him.

Under such conditions it can be easily understood that mistakes would be sure to arise. In many cases duplicate specimens would be numbered and sent for name, corresponding numbers being placed on other specimens, which were retained by the collector. Unless specimens were rare, their return would often not be asked, in order to avoid the return express charges, but a list with numbers and the names would be returned.

Mistakes might happen in many ways. As has been said, "no one is infallible, not even the youngest of us," and these high authorities would certainly have some errors in their collections, and so name these species wrongly for others. Again, in handling the specimens, the numbers of a couple might drop off and then be accidentally transposed in replacing them, and this might occur either in the hands of the one who named, or the collector who sent them. Or the collector might make a mistake and think two closely allied forms the same and send one for name, while retaining the other as his numbered specimen.

Given an initial error, its spread would be inevitable. John Brown, who had had his specimens determined by so high an authority as the celebrated Dr. Blank, would at once become an authority among those of his acquaintance whose specimens have not been so authoritatively determined, and these collectors would be only too willing to have him name their specimens for them, and these in turn corresponding and exchanging with others would still more widely diffuse the error.

One error which has become very widely diffused is the transposition of the names "Gortyna nitela Guen." "Gortyna nebris Guen."

The author of those names described *nebris* first mentioning the white spots and then in the description of *nitela* wrote: "Taille et couleur de la *Nebris*, dont elle ne diffère que par l'absence complète des taches blanches," and yet in most collections the white marked one is called *nitela* and the one without white spots *nebris*.

Another common error is the transposition of the names *petulca* and *ferrealis* in the genus Xylina, which was current in all our Montreal collections from the time that Grote and Strecker were naming material for the late Mr. Caulfield, until I discovered the transposition when studying the genus a few years ago.

That that error must also have been widespread may be inferred from the fact, pointed out by Dr. J. B. Smith, that Dr. Holland figured *ferrealis* under the name *petulca*.

Of course, an error could not become almost universal unless some prominent authority were himself in error, and that has undoubtedly frequently been the case.

Dr. Scudder's writings afford several curious instances of this. In 1863 he published in the Proceedings of the Essex Institute of Salem, Mass., "A list of the Butterflies of New England," in which he describes as new *Melitæa Œnone* and *Melitæa Harrisii*, the latter being the species which Harris had placed hesitatingly under the name Melitæa Ismeria, Boisd. and Lec. Subsequently he ascertained by comparison of his *Œnone* with types of M. Nycteis, Doubl, and he had redescribed the latter species, so in his "Supplement to A List of the Butterflies of New England," published in Proc. Bos. Soc. Nat. Hist. XI., 1868, he corrected his error in regard to it, but in some way which he was never able to explain, made another error in saying that *M. Ismeria?* Harris was a synonym of Nycteis and not of M. Harrisii Scudder. In his magnificent work on the Butterflies of New England he made three transpositions. On plate 3, he transposed the numbers of the figures of *Grapta Interrogationis* var. Umbrosa and var. Fabricii, this he corrected in the appendix. On plate 10, he transposed the numbers of what he called Atrytone Zabulon male and female, but which is really Hobomok, and to this I called his attention, and in his third volume, in the part devoted to butterflies not found in New England, he transposed the descriptions of Brenthis Freija and Chariclea.

More recent examples of curious transpositions are well known to most of us occurring in Holland's beautiful "Moth Book," and these, unfortunately, will have a wider effect on account of the thousands who will use the book, not one in ten of whom will ever see the corrections which have been published.

Another class of errors is composed of those which have a purely typographical origin. A curious one of this kind, which, however, has no importance, occurs in a paper by C. E. Worthington, formerly of Chicago, Ill., entitled "Notes on Argynnis Alcestis." (Can. Ent. X. 38.) After saying that both Alcestis and Aphrodite were found in the neighbourhood of Chicago, but generally at different localities, he says: "I have been greatly surprised at the readiness with which a strong *aphrodite* upon the prairie can be distinguished, while on the wing from the surrounding *alcestis*, etc.," and I feel sure he wrote "stray," but that it was misprinted "strong," and this error was reproduced by Edwards in his magnificent work on the "Butterflies of North America."

More serious errors of typographical origin, or perhaps merely through careless transcription, are those in connection with names.

CORRECTIONS OF ERRORS IN HOLLAND'S MOTH BOOK.

Plate.	Fig.	Name Given.	Should Be.	Correction By.	Publication.
vi.	1	*Cocytius antæus, Dru*	*C. cluentius Cr.* ♂	E. A. Smyth, Jr.	*Ent. News*, xv., 105.
xvi.	9	*Hyphantria cunea*	*H. textor*, as in text	H. H. Lyman	
xvii.	23	*Euthisanotia grata*	*E. unio*	E. J. Smith	*Ent. News*, xvi., 88.
	24	" *unio*	*E. grata*	"	"
	16	*Alypia Langtoni* ♂	*A. octomaculata*, as in text	H. H. Lyman	
xviii.	14	*A. lepusculina*	*A. populi*, as in text	"	
	16	*A. Radcliffei*	*A. albarufa*, as in text	"	
	24	*A. xyliniformis*	*A. lithospila*, as in text	"	
xxiv.	34	*Heliophila albilinea*	*H. diffusa*	E. J. Smith	*Ent. News*, xv., 221.
xxv.	9	*Xylina petulca*	*X. ferrealis*	J. B. Smith	*Ent. News*, xv., 104.
xxvi.	5	*Papaipema inquæsita*	*P. impecuniosa*	E. J. Smith	*Ent. News*, xv., 221.
	8	" *nebris*	" *nitela*	"	"
	9	" *nitela*	" *nebris*	"	"
xxix.	66	*Cydosia majuscula*	*Tricostibas calligera*	H. G. Dyar	*Can. Ent.*, xxxvi., 26.
xxx.	15	*Drasteria crassiuscula*	*D. erechtea*	E. J. Smith	*Ent. News*, xv., 221.
xxxi.	4	*Catocala subviridis*	*C. Agrippina*	Wm. Beutenmuller	*Can. Ent.*, xxxvii., 292.
	8	" *retecta*	*C. luctuosa*	"	"
	11	" *flebilis*	*C. Angusi var. lucetta*	"	"
	14	" *obscura*	*C. residua*	G. H. French	*Can. Ent.*, xxxvi., 54.
xxxii.	5	*C. dejecta var. Carolina Holl.*	*C. flebilis*	Wm. Beutenmuller	*Can. Ent.*, xxxvii., 292.
	6	*Catocala relicta*	*C. relicta var. clara*	"	"
	7	" " *var. bianca*	*C. relicta*	"	"
xxxiii.	1	" *Californica*	"Looks like a pale C. Irene"	"	"
	4	" *Ultronia var. Celia*	*C. Ultronia var. Adriana*	"	"
xxxiii.	7	*Catocala Ultronia var. mopsa*	"Not *mopsa*, but another var."	"	"
	8	" *Augusta*	"Looks like *C. Californica*"	"	"
xxxiv.	7	" *ilia var. osculata*	"Looks like *C. ilia*"	"	"
xxxv.	1	" *amasia*	*C. sancta*	"	"
	2	" *similis*	*C. similis var. aholah*	"	"
	3	" " *var. aholah*	*C. similis*	"	"
	5	" *fratercula var. jaquenetta*	"Looks like *C. blandula*"	"	"
	7	" *præclara*	*C. gracilis var. sordida*	"	"
	13	" *Stretchii*	*C. Mariana*	G. H. French	*Can. Ent.*, xxxvi., 54.
	14	" *Californica var. Cleopatra*	"Looks like *C. Californica*"	Wm. Beutenmuller	*Can Ent.*, xxxvii., 292
	15	" *Rosalinda*	Looks like *C. Californicc var. Cleopatra*	"	"
xlii.	32	*Tephroclystis absinthiata*	*Macaria infimata*	H. G. Dyar	*Can. Ent.*, xxxvi., 26.
	25	*Paleacrita vernata*	*Alsophila pometaria*	G. W. Taylor	*Can. Ent.* xxxvi., 245.
	49	*Mesoleuca intermediata*	*Petrophora fluctuata*	"	"

CORRECTION OF ERRORS IN HOLLAND'S MOTH BOOK.

Plate.	Fig.	Name Given.	Should Be.	Correction By	Publication.
xliii.	10-11	*Hydriomena custodiata*	*Hydriomena excurvata*	H. G. Dyar	*Can. Ent.*, xxxvi., 26.
	36	*Deilinia variolaria*	*Deilinia erythremaria*	G. W. Taylor	*Can. Ent.*, xxxvi., 245.
	39	*Philobia enotata*	*Philobia notata* (of Europe)	"	"
xliv.	2	*Caripeta angustiorata*	*Caripeta seductaria*	"	"
	32	*Plagodis emargataria*	"I think *P. alcoolaria*"	"	"
xlvii.	15	*Euclea chloris*	*E. indeterminata*	H. G. Dyar	*Can. Ent.*, xxxvi., 26.
	21	*Cochlidion y-inversa*	*Tortricidia flexuosa*	"	"
	27	" *rectilinea*	*C. latomia*	"	"
xlviii.	22	*Tortrix albicomana*	"Is very unlike the type"	W. D. Kearfott	*Ent. News*, xv., 105.
xlviii.	24	*Platynota flavedana*	*Olethreutes nimbatana*	"	"
	40	*Epagoge tunicana*	"Probably *Sparganothis senecionana*"	"	"

Corrections to the "Key to the Families," supplied by Dr. H. G. Dyar.

Page 24: Under 3, for 15 read 14. Under 14, for 17 read 16.

Page 25: Under 25 add a line, "Fore wing with vein 5 nearer to 4 than to 6 26." Under 26, for 26 read 27.

On page 62 the reference after Hæmorrhagia thysbe should be to Plate II., not I.

On page 337 Epelis faxoni Minot is referred as a synonym of Epelis truncataria Walk. E. J. Smith, *Ent. News*, xv., 221, says erroneously.

Page.	Text. Fig. Named.	Should Be.	Correction By.	Publication.
378	*Inguromorpha basalis*	*Cossula magnifica*	H. G. Dyar	*Can. Ent.*, xxxvi., 26.
379	*Cossula magnifica*	?	"	"

In *Ent. News*, xv., 105, W. D. Kearfott says, "Several of the generic names used by Dr. Holland differ from those used in Prof Fernald's latest published list of Pyralids, Zinckenia Zell. for Hymenia Hbn., Glyphodes Gn. for Diaphania Hbn., Phlyctænodes Gn. for Loxostege Hbn., and he has repeated the error which occurs in both Dyar's Catalogue and Smith's 1903 List, Alceris in place of Acleris."

Most collectors know the pretty moth named *Plusia Ærea,* Hubn, and the one so much like it that it was named *Æreoides* by Grote. The name of the latter was correctly printed up to the issue of Dr. Smith's Catalogue of Noctuidæ in 1893, in which it appeared cut down to Æroides, but whether through the error of author or printer, I am unable to determine, and since then I have hardly ever seen it correctly spelled anywhere. Dr. Dyar fell into the same error in his catalogue of 1902, though he gave the correct spelling in his index, and Dr. Smith, in his check list of 1903, repeated the error, and everywhere the same erroneous spelling is copied, including publications issued by Dr. E. P. Felt, State Entomologist of New York, and in the lists of British Columbian Lepidoptera recently issued.

In order to render my copy of Dr. Holland's Moth Book as correct as possible, I have tabulated the corrections which have been made from time to time in different publications by different writers, and have myself discovered five discrepancies between names on plates and in the text. If any corrections have been made which I have not noticed, or if any of the corrections have been proved erroneous, I would greatly appreciate being informed of the facts.

CONFLICTS BETWEEN ANTS.

BY G. E. SANDERS.

Following are notes on a series of conflicts between two species of ants—*Myrmica scabrinodes sabuleti, Meinert,* and *Lasius niger Americanus*:

While making night observations on the Corn-root ant, *Lasius niger Americanus,* in August, 1909, Mr. W. P. Flint and myself accidentally caused a very curious conflict between the workers of a Lasius nest, and those of a nest of Myrmica. For the three nights following we were fortunate enough to have it repeated and to get several variations in the original procedure of Myrmica. It is on these variations in the actions of Myrmica that I intend to dwell particularly, and I will leave it to the reader to decide as to whether we had an unusual series of accidental happenings, or if Myrmica is endowed with a certain amount of reason.

To describe the situation:—The Lasius nest, containing about 250 workers, was situated under the edge of a wide furrow which we had plowed through a corn field; the furrow was 6 inches deep, and the bottom of it cleaned out with shovels, leaving a smooth surface, one foot in width. The Myrmica nest, containing about 60 workers, was situated in the bottom of this furrow, about 8 inches away from the opening of the Lasius nest; 6 inches beyond this, and in the bank opposite the first Lasius nest, was a second Lasius nest, containing about 150 workers.

Both species of ants are for the most part nocturnal, at least in their movements on the surface. During warm nights throughout the summer one will find from 1-10 to 1-4 of the workers of a Lasius colony on the surface, foraging within two feet of the entrance to the nest; a few individuals forage at greater distances, but the majority forage near the nest. This enables them to attack and kill, by force of numbers, almost any small insect, up to the size of the common Carabid, *Agonoderus pallipes,* which is unfortunate enough to fall among them. They exhibit great courage and skill in attacking these insects, which are often 12 to 15 times as heavy as a Lasius worker. Myrmicas seldom forage near their nest; they forage singly at great distances, often 10 feet from the nest, and seldom attack living insects. It often happens that a Myrmica, in foraging, will wander into a migrating line or band of Lasius foragers. Several Lasii will immediately attack it, one holding to each leg or *antenna,* and will drag it from the vicinity of the nest or line, as it happens to be, and there leave it to go as it will, making no attempt to kill it. The Myrmica, in such cases, offers no resistance whatever, and will remain almost motionless while being dragged away. Occasionally a solitary Myrmica and a solitary Lasius will meet, and while the Lasius will usually avoid the Myrmica, it will sometimes attack the larger ant. In such cases the Myrmica will stand higher in the air than usual, moving about slowly, keeping the Lasius, which is attempting to get a hold on its legs or antennæ, a little to one side and slightly in front of its head. They will often fence in this manner for a minute or more until the Lasius gets in the proper position, when the Myrmica, with a spring, swifter than one would imagine such an ungainly ant capable of, will seize the Lasius, usually by the petiole from the upper side, and lifting it in the air, will carry it to the nest, possibly for food.

Myrmica, while a very sluggish and awkward ant, shows itself in cases such as the two mentioned (and probably 100 of each were observed during the summer), to be a very cool, deliberate, and, if such a term may be used, calculating ant. Lasius moves more quickly, and apparently more blindly than Myrmica.

On the night of August 18th and 19th, while feeding the foragers about the larger Lasius nest, some of the food insects dragged themselves near the opening of the Myrmica nest before they were overpowered. In the excitement of capturing the insects, 75 to 100 Lasius had come out from their nest and were busily engaged near the Myrmica entrance in dragging the dead insects back to their own nest. At this moment a single Myrmica appeared at the opening of its nest, and in a second disappeared. In less than a minute three more Myrmicæ appeared and after running about on the surface for a few seconds in an excited manner, disappeared into their entrance. A few seconds later the whole colony of Myrmicæ, with the queen, came pouring from their nests, many of them carrying young, and very evidently prepared to migrate. A few of the Myrmicæ attacked the Lasii nearest them, while the rest ran about aimlessly for a few seconds, and then returned the young to the nest. The majority of the Myrmica workers now began an earnest attack on the Lasii, driving them slowly away from the insects which they had captured, and in the course of 15 minutes had them all driven back into their nest, leaving the insects near the Myrmica nest where they had abandoned them. The queen Myrmica remained on the surface only a few moments after the young were returned to the nest; she did not go more than three inches from the entrance and took no part in the battle.

After the Lasii had all been driven in, most of the Myrmicæ returned to their nest, leaving about 20 of their number, apparently standing guard, about the Lasius entrance, where they remained for some time, the last ones leaving and returning to their own nest about twenty minutes after the last Lasius had disappeared. The Myrmicæ in returning to their nest scarcely noticed the dead insects, two of them dragged a dead back-swimmer about for a moment and abandoned it. The remains of the insects were found at their entrance the next morning, showing that during the night they had dragged them in and devoured them.

On the night of August 19th-20th, the Lasii were brought near the Myrmica nest by feeding with living insects, this time purposely. The Myrmicae in appearing on this night were somewhat less excited than on the previous night, most of them attacking the Lasii as soon as they emerged from the nest. A few young, less than ten, were brought to the surface, as they emerged, and immediately returned to the nest. The queen remained in the nest throughout this battle. The time occupied in driving the Lasii into their nest was about fifteen minutes. After they were driven in, a number of the Myrmicæ—about 20—remained at the entrance as before, the last of them leaving the entrance fourteen minutes after the battle proper closed.

On the night of August 20th-21st, the Lasii were enticed out near to the Myrmica nest in the same manner as before. Their presence was discovered by two Myrmica workers which alarmed the nest. The Myrmicæ, in appearing on this occasion, did not bring their young with them, but among the last of the ants which came pouring from the entrance, the queen appeared. The Lasii were at once attacked and driven away from their captures and in about fifteen minutes were all driven into their entrance. The queen Myrmica remained on the surface not more than two minutes; her presence there was probably accidental. It is possible that she was caught in the swarm of workers emerging and carried along with them. She took no part in the battle, not going more than an inch from the entrance to her nest. The Myrmicæ on this night did not remain at the Lasius entrance more than two minutes after the last Lasius had disappeared.

On the night of Aug. 22nd-23rd, the drawing out of the Lasii and the emergence of the Myrmica workers was exactly the same as on the previous nights, excepting that the queen did not appear. No young were brought to the surface by the Myrmicæ on this occasion. The Lasii were driven from their food and into their nest in approximately the same time as on the two previous nights. After the Lasii had all disappeared the Myrmicae scarcely remained at their entrance at all, returning to their own nest almost immediately.

On the night of Aug. 23-24th we had an exact duplicate of the proceedings of the previous night, until the battle was well under way, when we drew out the second and smaller nest of Lasius. By using insects which they were particularly fond of we drew them up to the rear of the line of fighting Myrmicae, about as near the Myrmica nest as the first nest of Lasius had been when the Myrmicae attacked them. When this second nest of Lasius came near so that the Myrmicae began to notice them the last of the large nest of Lasii were disappearing. The appearance of this second nest seemed to demoralize the Myrmicæ, which were already in some disorder, and instead of attacking, as we expected they would, most of them ran around the cluster of Lasii and disappeared into their nest; a few of them attacked the Lasii, but not being supported, fell off and returned to the nest, leaving the second nest of Lasius in full possession of their insects, which they dragged to their nest.

On account of the nights becoming suddenly colder, we could not get Lasius to come out, and so had to discontinue the observations. One of the most curious things was the apparently regular battle formation of Myrmica. In every case, soon after the conflict began the Myrmicæ would form in a somewhat irregular line, with only a few workers behind, and a few in front of this line, those behind fighting with the straggling Lasii, and those in front being attacked by several Lasii and seldom moving, simply allowing the Lasii to pull at them. The line was always thickest at the centre, and thinnest at the ends where the Lasii were least numerous. The ends in all cases advanced faster than the centre, so that towards the end of the battle the line would assume the shape of a horseshoe. On the night of the 23-24th when we brought up the second nest of Lasii behind this apparent formation, which was already partially broken up in driving the first nest of Lasius into its entrance, the Myrmicæ apparently did not know what to do. A few put up a weak fight and in a few moments all retreated, leaving the Lasii in possession of their insects right at the Myrmica entrance. There were plenty of Myrmica workers out to drive off the Lasii, for there were not nearly as many of the second nest out as there had been of the first. Does this indicate that the Myrmicæ fight in a more or less regular formation, and being surprised when this formation was broken up, they retreated rather than fight?

Another thing: On the night of August 18-19th, when the Myrmicæ were first disturbed they brought all of their young to the surface with them. From having seen dozens of Myrmica migrations, we can say positively that they were fully prepared to migrate. On the second night we find only a few young brought to the surface and immediately returned, showing them to be less excited over the presence of Lasius than on the previous night. On the third, fourth and fifth nights no young were brought to the surface at all. It was fear that induced them to bring their young to the surface the first night; on the second night we find that fear greatly abated, as fewer young were brought to the surface and kept there for a much shorter time. On the third, fourth and fifth nights we find no young brought to the surface; so, evidently, they had no fear of their nest being raided by Lasius. Can we conclude that this nest of Myrmica was profiting by experience? It certainly was showing a degree less of alarm over the appearance of Lasius after each successive conflict.

Again, on the first night of the battle, the Myrmicæ stood about the entrance of the Lasius nest for 20 minutes after the last Lasius had disappeared. Whether they were simply wondering where they had gone, or, whether they expected them back, and so were picketing the entrance to prevent their reappearance, we cannot say. On the second night we find them waiting about this entrance for less than 15 minutes. On the third night we find them waiting less than two minutes, and on the fourth night, scarcely waiting to drive the last Lasius in. Does this indicate that they slowly proved to themselves the futility of waiting; that they remembered their earlier experiences, and so did not wait at all on the night of the 22-23rd?

The notes on these conflicts were taken at the same time, separately by Mr. Flint and myself, and later compared. The notes on the behaviour of Myrmicæ, when in ordinary conflicts with the Lasius, are from hundreds of observations, and go to show the cunning of the Myrmica in battle.

The questions which I am not attempting to answer, are those which suggested themselves to Mr. Flint and myself when taking the notes.

THE SPRUCE BUD-WORM, TORTRIX FUMIFERANA, CLEMENS.

BY ARTHUR GIBSON, CHIEF ASSISTANT ENTOMOLOGIST, EXPERIMENTAL FARM, OTTAWA.

During the early part of the past summer the Spruce Bud-worm was especially abundant in Canada. Towards the end of July the Deputy Minister of the Department of Agriculture was informed by the Hon. Senator Edwards that some kind of an insect was doing much damage to spruce and balsam trees in the above district, and as a consequence I was instructed to proceed at once to the infested locality, to investigate the outbreak.

Early on the morning of July 29th, therefore, I left Maniwaki, Que., in company with Mr. M. Boyle, of the W. C. Edwards Company, and drove to Baskatong, about 40 miles due north, which place we reached about 5.30 in the afternoon. Around Baskatong the injury to spruce and balsam was very apparent, owing to the conspicuous reddening of the tops of the trees. Early the following morning we left Baskatong and spent the whole day examining trees at different points. As soon as the first tree was cut down I saw at once that a lepidopterous insect had been at work. Thousands of the empty pupal cases of the moths were present on the trees, and these, with the partly eaten and discoloured dead foliage, together with the excrement from the caterpillars, gave the conspicuous reddish appearance to the tops of the trees. The injury for this year, of course, had stopped before the time of my visit. The caterpillars had evidently become full-grown during the first and second weeks of July. Moths which had issued some days before the end of July were present in large numbers on the trees, and from fairly good examples collected, I saw that the species was *Tortrix fumiferana,* Clemens, which is known popularly as the Spruce Bud-worm. The caterpillars had fed chiefly at the tops of the trees, although some injury was done towards the ends of many of the lower branches. The foliage for about four or five feet from the tops of the infested trees was almost wholly destroyed, being either partly or completely eaten by the caterpillars. This, with the exposed pupal cases above referred to, gave the trees the conspicuous reddish appearance, and caused the rather widespread report among lumbermen that the trees were dying. In looking over a valley on the opposite hillside, the trees appeared as if fire had swept through the region. Other than loss of foliage and the consequent setback thus caused, the trees did not seem to be seriously injured. The tops were perfectly green under the bark.

The outbreak of the Spruce Bud-worm this year has been most remarkable and very widespread. Not only has this insect done much damage all through the Upper Gatineau country and other adjacent districts, where there are large tracts of spruce and balsam trees, but even in British Columbia reports have been received of much injury by the Tortrix. Dr. C. Gordon Hewitt, Dominion Entomologist, when in British Columbia, in October last, saw the conspicuous work of the insect and received reports from local entomologists concerning its ravages.

The Spruce Bud-worm, when mature, is nearly an inch in length, tapering slightly from the middle to the end. In colour it is dark brown and bears conspicuous whitish-yellow piliferous tubercles, and along the side of the body there is a yellowish stripe. The eggs of the insect are scale-like and are deposited in clusters overlapping each other. The partly grown caterpillars pass the winter among the terminal shoots of the trees, completing their growth the following year. The moth expands about 7-8 of an inch when the wings are spread. In colour it is dull gray, the fore wings overlaid with bands, streaks and spots of brown. In the middle of the upper margin of the front wings there is a rather large conspicuous whitish spot. In British Columbia, this year, the moths were of a distinct reddish colour, but all the eastern specimens noticed were of the gray form.

When an insect attacks forest trees, such as has been the case with the Spruce Bud-worm the past summer, it is, of course, impossible to do anything in the way of applying remedial treatment, such as is done for leaf-eating insects when attacking orchard or ornamental trees. Fortunately an outbreak of such a nature, however, is generally attended by natural parasites, which sooner or later restore the balance of nature. From observations made, and from parasites reared in the Division of Entomology from material collected in the Baskatong District, we have reason to hope that the Spruce Bud-worm will not next year continue to any serious extent its work of destruction. Undoubtedly, too, birds will help materially to reduce the numbers of the hibernating caterpillars.

In the forthcoming annual report of the Division of Entomology of the Dominion Experimental Farms, covering the injurious insects of the year 1909, it is purposed to give a much fuller account of the injury done to spruce and balsam trees by the above insects not only in the Upper Gatineau country of the Province of Quebec, but also in British Columbia.

THE SNOW-WHITE LINDEN MOTH.

(*Ennomos. Subsignarius, Hubn.*)

By A. F. Winn, Westmount, Que.

Poor as the summer of 1909 has been for most species of butterflies and moths in the neighborhood of Montreal, conditions must have been favourable for this White Geometrid Moth, for during August swarms of them about the electric lamps in our streets attracted the attention of many persons who do not usually take much heed of insects that do not sting them.

For at least twenty years, prior to 1908, the moth might well be considered a rarity and my captures of it in that period did not exceed an average of one specimen per annum, and these were all taken in the woods flying among linden, beech and maple trees. In 1908 there were great numbers of larvæ in June, in the woods at the eastern end of Montreal Island, feeding on the leaves of the trees above mentioned, as well as birch, completely stripping the lower branches of their leaves, the dropping of the frass on the leaves and ground sounding like the patter of a smart shower of rain.

I was out of town the last two weeks of July, during which time the principal part of the flight of the moths occurred, but scores of dead moths in store windows and spider webs, and broken-off wings in little heaps at base of electric light poles and in gutters, showed plainly that the flight must have been one of myriads. The Entomological Record for 1908 tells of the occurrence at Ottawa, July 23rd.: Dr. Felt's 24th Report records its abundance through New York State and Massachusetts, with figures of larvæ and pupæ and plate of eggs and imago; and Mr. W. H. Broadwell in the *Canadian Entomologist* (XL. 327) gives, under title of "A July Blizzard," an interesting account of the flight of swarms of moths at Newark, N.J. The last writer has again an article in the November number of our magazine mentioning that the 1909 crop of moths was even greater than that of the previous year. The same thing has occurred here and doubtless in many other places, and as Mr. Broadwell aptly remarks, it is "very unusual for an insect ordinarily rare to appear in great numbers for two succeeding seasons." If this insect's periods of visit in swarms are always separated by such a long term of years it cannot have many parasites peculiar to itself, or they would surely starve during all the lean years. Toads, bats, cats and sparrows undoubtedly had a sumptuous repast in the cities, but they have quite a choice of diet. It will be interesting to note whether there are any of the moths next year; if not, we may have to leave future observations to our successors, as the astronomers do with the comets.

On the morning of August 2nd, on my return from a vacation, large numbers of the moths were seen clinging, with their wings closed over their backs, to the office buildings down town, particularly at, or near, the street corners where the arc lamps had evidently attracted them the previous night. The following day there were still some moths about town, and all taken and seen on both days were males.

On August 9th they were again plentiful at the lights during the evening—every lamp passed by in a three-mile walk had its swarm of white moths about it. An incandescent lamp on my gallery attracted many of them, the numbers increasing as it became later, and about 11 p.m. there were often between 20 and 30 flying around and the brick wall of the house was spotted all over with white.

On the 14th, the moths were again noticed down town, in good condition, on walls and windows of buildings and all were males so far as noticed.

On August 24th, after 10 days apparent freedom from them, they were again plentiful and in equally good condition. Evidently there had been a large flight to the lamps the previous evening. Dr. Bethune happened to be in Montreal in the evening of the 23rd and in crossing the city from the Windsor to the Place Viger Railway Station, observed and wondered at the great quantities of white moths around nearly every lamp, capturing some to make sure what they were and was surprised to find E. subsignarius swarming at so late a date—a full month later than in 1908. Among my captures on 24th August, was one female, the only one seen attracted to light among several thousands observed of the male sex.

On September 4th, a couple of females were found on tree trunks in Mt. Royal Park, but they were worn and nearly dead—too weak to lay any eggs. These were the last that I noticed alive. Wings and dead moths still adorn many corners and basement window sills that are not swept out so carefully as they might be.

The simultaneous appearance of unusual numbers of any insect always makes one suspect migration from distant warmer parts, where they have been drawn up into the upper air and carried along by the wind, certain numbers dropping off here and there, as is the case with such moths as the Cotton Moth (*Alabama argillacea*), Erebus odoratus and many of the Southern Sphingidæ. I am inclined to think that in this case all the insects were bred in the neighborhood, but it is difficult to account for their excessive abundance on certain nights and absence on others over such a long period unless certain weather conditions are necessary for the final transformation from pupa to moth, or that only under favourable conditions are the male moths inclined to visit the lights. A study of the McGill College Observatory report of the local weather for the month throws no light on the subject, neither temperature, humidity, direction, or velocity of the wind, nor rainfall appearing to show any relation to the flights; but of course, a west wind might bring the moths from a tract of woods lying west of the city on one evening, while an east or a north wind might have the same effect on other evenings on those bred in the respective directions. It is quite certain the swarms of moths seen in St. James Street did not breed within a mile radius of Montreal General Postoffice. It is a curious coincidence that our other species of Ennomos, E. magnarius, usually so plentiful in September, has been scarcely seen at all either in 1908 or 1909.

NOTES ON FRUIT TREE SCOLYTIDS.

BY J. M. SWAINE, MACDONALD COLLEGE, QUE.

There are three species of scolytid beetles occasionally injurious in parts of this country to orchard trees. Two of them, *Eccoptogaster rugulosus,* Ratz., and *Phlœotribus liminaris,* Harris, have recently caused considerable uneasiness in certain fruit districts of Ontario, and the third, *Xyleborus dispar,* Fabr., has been a well-known pest of Nova Scotian apple orchards for some years.

Apparently these insects are not serious pests in Quebec Province. *X. dispar* is found here commonly in *Betula lutea* and other forest trees, but I have not yet taken it in Quebec from orchard trees. The first two species are at least rare in the Montreal district.

Inquiries have come to this Department recently for an easy method of separating these three forms, and the following notes are to that end.

The Shot-hole Borer, *Xyleborus dispar,* cuts round, black tunnels deep into the wood; in small branches or stems one division of the tunnels partially girdles the wood. The eggs are laid free in the galleries early in June, and the larvæ feed upon the fungus which grows upon the tunnel walls, and gives the dark stain just referred to. The larvæ do not enlarge the tunnels, and emerge when matured, through the entrance hole cut by the mother insect. In the other two species each individual beetle, when ready to emerge, cuts a separate hole through the bark.

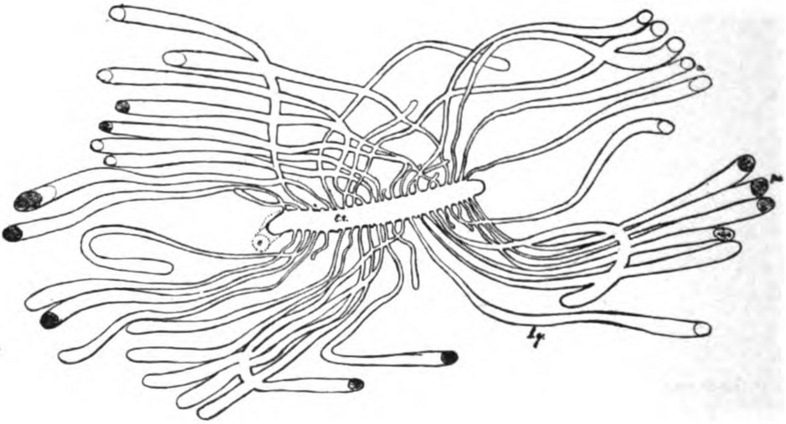

FIG. 1. Tunnels of E. rugulosus in peach: (*e*) entrance hole; (*e.t.*) egg tunnel cut by adult; (*l.g.*) larval gallery ending in *p.c.*—the pupal cell.

This species breeds in various forest trees and in fruit trees. Of the latter it apparently prefers the apple, and does harm chiefly to the young stock. The remedies aim to repel the tunnel-cutting females, which do the entire damage, or to destroy the food-fungus and the brood within the tunnels. Good results have been obtained in Nova Scotia from the use of a wash made of 3 gallons of water, 1 gallon of soft soap, and half a pint of crude carbolic acid. This wash is applied several times while the beetles are prevalent, the first application being made about the first of June. Badly infested trees should be burned, and those still of value may be treated with carbolic wash, and should receive good cultivation and plenty of fertilizer. Trees in good health are less liable to attack. Diseased

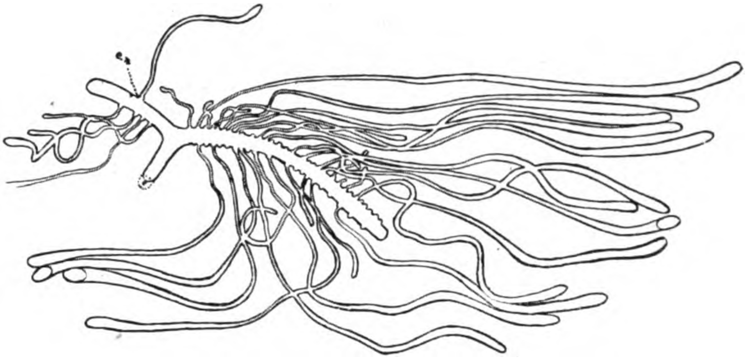

FIG. 2. Tunnels of P. liminaris: (*e.n.*) egg-niche.

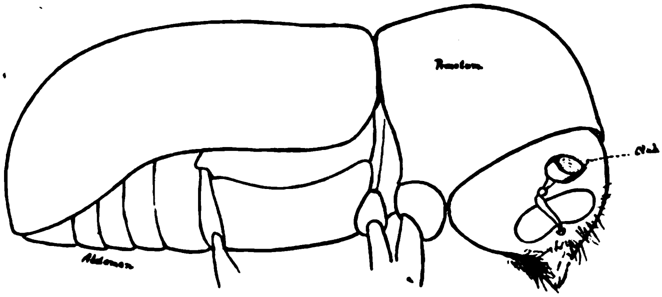

FIG. 3. Xyleborus dispar from the side, legs removed.

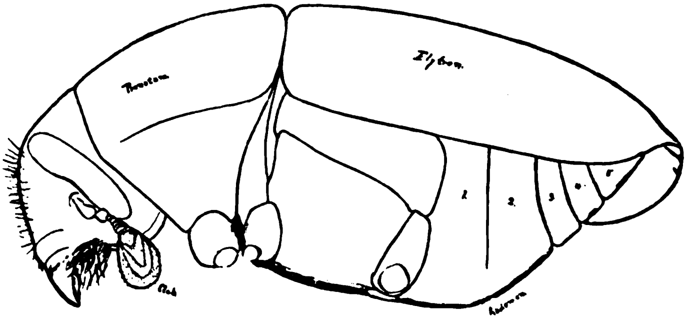

FIG. 4. Eccoptogaster rugulosus from the side, legs removed.

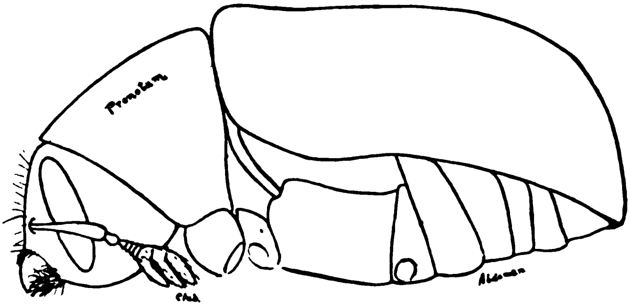

FIG. 5. Phloeotribus liminaris from the side, legs removed.

and dying branches should be removed and burned before the first of June. When fresh holes of this beetle are found in small trees, it is an easy matter to inject into the holes a little kerosene or other oil. The oil kills the insects which it wets, and destroys the food-fungus, with fatal results to the beetles and larvæ.

The adult female is black, cylindric, and about one-eighth of an inch in length. The pronotum is bent very strongly ventrad in front, so that the anterior opening is nearly horizontal. The head is globular and deeply sunk in the pronotum. The antennal club is sub-globular and truncate distally. The venter of the abdomen is evenly rounded. The truncate club and the strongly bent pronotum, as well as its larger size, distinguish it instantly from the other two. The males are much smaller than the females, wingless, and of a curious hump-backed shape.

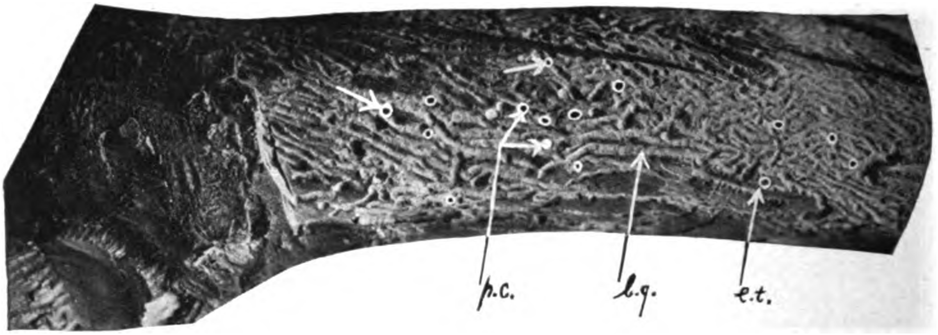

FIG. 6.

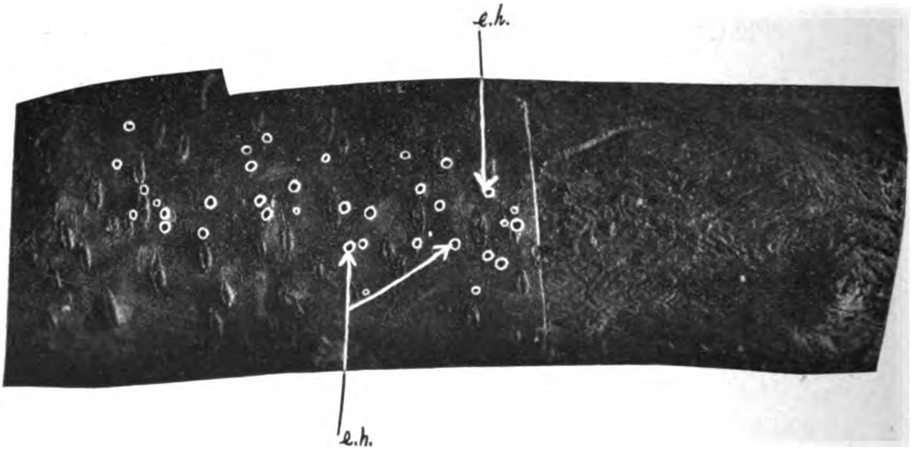

FIG. 7.

FIGS. 6 and 7. Work of E. rugulosus in apple; (*p.c.*) pupal cells sunk into the wood; (*e.h.*) exit holes of matured beetles. These holes lie usually immediately over the pupal cells. The smaller holes in figure 7 were cut by parasites.

The Peach-tree Bark-beetle, *Phloeotribus liminaris,* cuts all its tunnels between the bark and the wood. An egg-tunnel is cut by the adult and the eggs laid in niches along the sides. The larvæ bore away from the egg-tunnel, keeping between the bark and the wood, eventually following the grain of the wood, and pupate in the enlarged end of the larval galleries thus formed. Later they appear through holes cut in the bark above the pupal cells. The egg-tunnels of this species

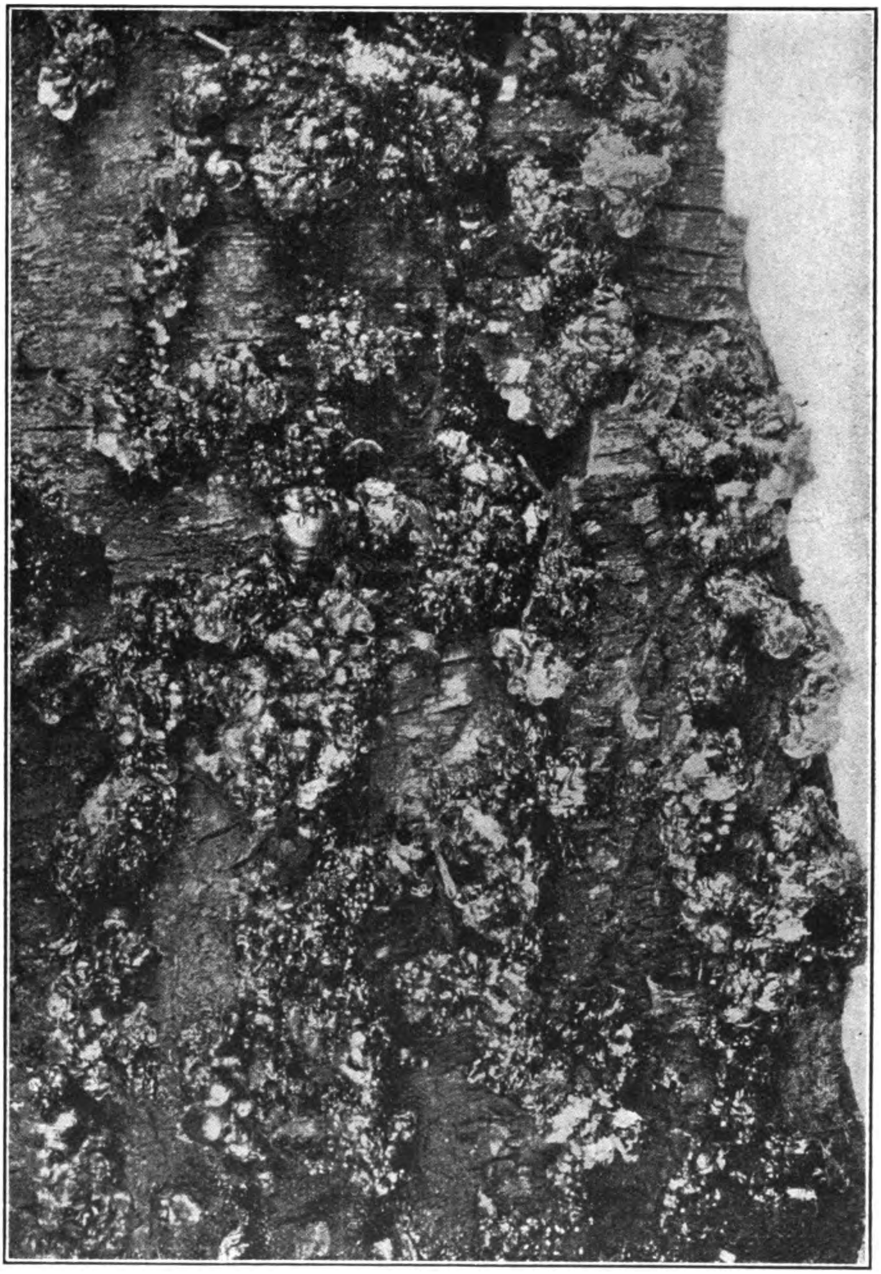

FIG. 8. Exuded Peach Sap from punctures of Fruit Bark-Beetle, (after Lowe, N.Y. Agr. Exp. Sta., Bull. 180).

are distinguished from those of *rugulosus* by a short side-branch which forms, with the short tunnel leading to the opening in the bark, a Y-shaped end to the main division, (See Fig. 2). The adults are brownish-black, about one-tenth of an inch in length. The pronotum is not bent strongly ventrad in front, so that the anterior opening is oblique. The head is large and visible from above. The antennal club is lamellate, divided into three separated, laterally produced segments. The venter of the abdomen is not bent strongly dorsad behind.

The damage inflicted by this beetle is mainly to the cherry and peach. Trees in apparent good health are attacked in the fall by the hibernating adults, and from the short tunnels then cut much sap exudes during the following season. Healthy trees are also attacked by the adults during the egg-laying season, but the vigorous flow of sap invariably drives them away. The brood can be reared only in weakened and dying trees. Successive attacks, however, will so weaken a tree that eventually the egg-tunnels can be cut and the brood reared, the result of which is the utter destruction of the inner bark. Slightly injured trees from which the beetles have been driven by the flow of sap should be well fertilized and protected from further injury, by a repellant wash. All dead and dying limbs and trees should be removed and burned before the emergence of the contained brood. Seriously injured trees are improved by a severe pruning. Mr. H. F. Wilson recommends the use of thick whitewash as a repellant, to be applied before the attack of the borers (Bull. 68, part IX., U.S. Bureau of Entomology). Good results seem to have been obtained in Ontario with lime-sulphur wash and with "Sanders' Wash" applied to the trunk and bases of the branches early in spring, about the first week in March, and again in July before the second attack.

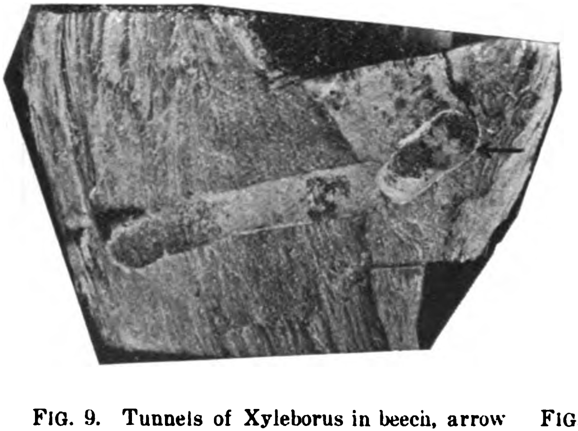

FIG. 9. Tunnels of Xyleborus in beech, arrow points to eggs.

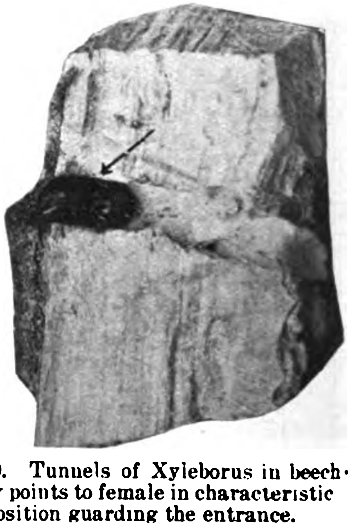

FIG. 10. Tunnels of Xyleborus in beech· arrow points to female in characteristic position guarding the entrance.

The Fruit-tree Bark-beetle, *Eccoptogaster rugulosus*, Ratz., is of the size and general appearance of *P. liminaris;* but the venter of the abdomen is bent sharply dorsad beyond the first segment, and the antennal club is solid, flat and marked by strongly angulated sutures. The galleries of this species are entirely between the bark and the wood; the ends of the larval galleries, which form the pupal cells, are often sunk a few millimeters into the wood. This species agrees with *P. liminaris* in general habits. It breeds in dying limbs and trunks, but like *liminaris,* injures living trees by driving short tunnels into the bark through which the sap flows copiously, later to harden and form the gummy masses which characterize the work of *P. liminaris* and *E. rugulosus* in healthy bark. This species attacks the apple, cherry and peach, and is often found working with *P. liminaris* in the same limb. The three washes mentioned above are also useful against this species

Clean culture is absolutely essential if these borers are to be controlled. Diseased and dying fruit trees furnish breeding grounds for these beetles and for numerous other insect pests, and should be burnt to prevent the spread of the insects beneath the bark and in the wood.

The following key will enable anyone to separate quite easily the three forms discussed. A hand-lens is needed for examining the antennæ, but the other characters are visible to the naked eye. The beetles are easily distinguished by their tunnels, as indicated by the diagrams.

A. Venter of the abdomen with the caudal portion bent abruptly dorsad. Antennal club flat and marked by angulated sutures. (Bark-borers) Eccoptogaster rugulosus (The Fruit-tree Bark-beetle).

AA. Venter of the abdomen normal, regularly curved.

B. Antennal club lamellate, of three separate, laterally produced segments. Head visible from above. (Bark-borers) Phloeotribus liminaris, Harris. (The Peach-tree Bark-beetle).

BB. Antennal club globular, truncate at the tip. Head deeply imbedded in the prothorax, the anterior margin of which is nearly horizontal, invisible from above. (Wood-borers, tunnels stained deep black). Xyleborus dispar, Fabr. (The Shot-hole Borer).

OBSERVATIONS ON ONTARIO INSECTS IN 1909.

By C. J. S. Bethune, Ontario Agricultural College, Guelph.

As Mr. Gibson and Mr. Caesar have already presented reports upon the insects of the season, it only remains for me to refer to some that have especially come under my observation, or that have been a source of trouble to many correspondents.

The weather during spring and early summer seemed peculiarly favourable to the multiplication of Plant-lice (Aphids). They were to be found in more than usual abundance swarming upon a great variety of trees, shrubs, and plants, and causing a great deal of injury by checking the growth and impairing the vitality of everything they attacked. Cabbage and turnip plants were affected by them early in the season, but they ceased in most cases to be much trouble later on, in marked contrast to last year when they were a very serious plague till the frost came and destroyed them. In the vegetable garden peas, potatoes and lettuce were especially attacked and in the flower borders roses, asters, hollyhocks, etc., and even ferns; currant bushes had their leaves covered with wart-like swellings beneath which swarms of aphids were huddled; plum and cherry trees showed signs of the intruders by the crinkled and twisted leaves at the ends of the branches enclosing multitudes of black lice; on the leaves of apple trees green aphids were abundant, while twigs were soft and foliage tender, but later on they migrated to more succulent plants, probably to the wheat fields. Many elm trees looked sadly out of sorts from shrivelled and distorted leaves covered with disgusting woolly lice, which were to be seen also wherever a scar was to be found on trunk or limb; great colonies of open feeding woolly aphids were also frequent on hawthorns. A clump of European lindens on the College lawn were so beset with lice that the leaves looked as if varnished owing to the incessant dripping of tiny drops of "honey dew," the sweet excretion from the hosts above; happily a couple of days of heavy rain washed the foliage clean and checked the increase of the aphis army. A handsome copper-beech on a friend's lawn in Hamilton was alarmingly attacked by another woolly form (the so-called wool is really wax), and its owner feared that permanent injury would result. In other places, maples, birches and various shade and ornamental trees were beset with these minute foes, while on firs and spruce were to be found the giants of the race, great black aphids, a hundred times bigger than the familiar green plant lice, belonging to the genus Lachnus. Widespread and varied indeed were the enemy, but their own foes speedily came to the rescue; Lady-bird beetles, yellow and orange and black, were to be seen in great numbers, and their larvae also were busily engaged in devouring the sweet morsels. The quaint, spiny chrysalids, sticking by their tails to the bark of trees, and occurring in masses, even fifty or more huddled together, were often sent in by observers fearing that they might be a new foe, and well pleased to learn that the formidable creatures were veritable friends. Syrphus fly larvæ and those of Lace-winged flies, aided by various other aphid eaters, combined to reduce the swarms, and these with a change of weather conditions, stayed or entirely removed the plague; during the latter part of the summer complaints almost ceased to be made. The standard remedies for these insects that live by sucking the juices of plants are kerosene emulsion, tobacco wash or strong soap-suds, preferably that made with whale or fish-oil soap.

Besides the scale insects referred to by others, there has been a widespread attack made upon trees in northern parts of the city of Toronto by the elm-tree scale (*Gossyparia spuria*). Last year it only came under my observation from its occurrence on the elms in a single garden, but it must also have been established unnoticed upon many others to have become so abundant this year. It would probably yield to treatment with the lime-sulphur wash applied at the usual time in early spring, but city dwellers with small gardens and few trees have no spraying outfit nor would they like to make use of a remedy so disagreeable to those who handle it. In their case much may be done by clearing off the scales with a scrubbing brush dipped from time to time in strong soap-suds. Where the elm-trees in parks, on boulevards and the sides of streets are attacked it is certainly the duty of those employed by the city to have the affected trees properly and thoroughly treated. Any neglect now may result in a widespread loss of these beautiful trees which grow so luxuriantly and are so attractive in and around Toronto.

The COTTONY MAPLE SCALE (*Pulvinaria innumerabilis*) which is essentially a town insect, attacking many other shade trees beside the maple, and when at its height spreading to plants of almost all kinds in parks and gardens, has been noticeable in several places this year. Like several other injurious insects it has its cycles of abundance and scarcity; increasing in numbers for some years and becoming a veritable plague, and then rapidly diminishing till it ceases to be noticed. This change is due, no doubt, to the attack of parasites combined with unfavorable climatic conditions. Repeated sprayings with kerosene emulsion when the lice are hatching out from the eggs contained in a waxy, cotton-like mass would keep the insect in check, and should be resorted to as soon as the scale is observed on the trees.

The oak trees in the neighborhood of the town of Galt have been stripped of their foliage both this year and last by the caterpillars of the Senatorial Moth (*Anisota senatoria*); the attack has been going on for four years and must result in serious injury to the trees if nature's checks do not soon come to the rescue. The caterpillars, when full-grown—which they were after the middle of September—are black with four ochre-yellow stripes along the back and two on each side. On each segment of the body there are six black spines or prickles, and behind the head two long slender horns projecting out on either side. The caterpillars feed together in great swarms, several hundred on a branch, and devour the foliage, beginning at the end of the twigs and moving downwards till they have completely stripped off all the leaves; then they move on to another limb. When at rest they huddle together in masses and if disturbed raise the fore part of the body and shake their heads in a threatening manner. They make no webs or cocoons, but descend into the ground to pupate and remain buried in the soil till the following June; the chrysalids then work their way to the surface and the moths emerge to lay their eggs and provide for a new generation. The eggs are laid in large clusters on the underside of oak leaves near the tips of the branches and the young caterpillars are hatched during the month of August. The moths are handsome creatures, ochre-yellow in colour with a shading of reddish-purple on the front and hind margins of the wings; an oblique narrow purple-brown band crosses the wings, and near the middle of each there is a conspicuous round white spot. The male moth is much smaller than the female and more tinged with purple, the expanded wings measuring about an inch and three-quarters; the female moth is fully two and a half inches in expanse, and often is entirely yellowish with no tinge of red or purple.

During the height of summer and throughout the autumn season numerous complaints have come in from many parts of the Province respecting White-grubs and Wireworms. The former have been more than usually abundant this year and have caused a great deal of loss by their attacks upon the roots of corn, grain of various kinds, strawberries, etc. The most remarkable and uncommon attack has been upon the tubers of potatoes, in which they have bored great holes and rendered them unfit for marketing or table use. Generally they feed upon the fibrous roots, but this year their numbers were so great that after consuming these the only food for them was the potato itself. As I have stated in the *Ontario Crop Bulletin* for November: "White grubs are the larvæ of what are familiarly known as May beetles or June bugs. They breed for the most part in old pastures and require three years to attain to maturity. Crops that are planted when an infested field has been broken up are usually attacked by these grubs. During the first year they feed to some extent upon the remains of the sod that has been turned under, but during the second year, there being nothing else, they attack the roots of whatever crop there may be. The best remedy for them is a short rotation of crops, so that there will be no time allowed for their attaining maturity. An infested field may be fairly cleared of them by permitting hogs to roam about; they will root the grubs up and eagerly devour them. Late plowing is desirable in order to break up their winter quarters and expose them to the weather and their various enemies. Working underground as they do, it is not practicable to apply any poisonous remedies. Dependence must be placed upon the methods referred to."

WIREWORMS, the larvæ of Click-beetles (Elateridæ), have a somewhat similar life-history to that of the White Grubs, except that the beetles pass the winter under the shelter of rubbish, tufts of grass, etc., and appear during the first warm days of spring, whereas the May-beetles, the adult form of White Grubs, remain buried in the ground during the winter and come out in May or June. Complaints of injury to the roots of many plants by the attacks of Wireworms have been received from various quarters, in fact never a year goes by without much loss from their depredations. The methods referred to above for the control of White Grubs seem to be the only effective remedies for Wireworms also.

GRASSHOPPERS, which have already been referred to by Mr. Gibson, were extremely abundant and destructive this year, attacking oats and other cereals, and injuring vegetation of almost all kinds. In this case, also, old pasture fields, where the soil is dry and sandy, are the favorite breeding grounds, and hot, dry weather the most suitable for their growth and increase. The worst attacks were reported from the counties around the Georgian Bay. At the beginning of August Mr. Cecil Swale, Secretary of the North Bruce Farmers' Institute, Wiarton, wrote as follows respecting the Grasshopper plague:

> "We have had these pests for four years in succession, each year worse than the preceding one. This year, I can go to farmers who off, say, 30 acres, have only got a load of fodder, counting hay, grain and everything. Many cut their oats three weeks ago to save what was left. I know fields to-day that are just standing oat stubs, the grain all on the ground. Nobody can quite credit the destruction they can do and are doing; you have to see for yourself. These pests breed in old pastures, roadsides and old meadows. Lots of these pastures cannot be plowed for rock, while being well adapted to this particular use. Then, again, you may have a first-class farm, and your neighbour has fifty acres of pasture alongside; the hoppers cross over and eat you out. You have no remedy. I have a pasture farm divided from the main farm by 100-acre swamp. I have not many hoppers, as all the home farm is pretty much under cultivation; but my neighbour on the other side of the pasture farm has been cleaned out by the hoppers off my pasture. My cattle have been starved off the fifty acres of pasture, and I have taken them up into my hardwood bush. My neighbour has not two loads of anything off a forty-acre clearance. Oats and barley and grass are their chief food. Peas they seldom touch.
>
> "We have been thinking a few experiments might be tried to destroy the eggs of the grasshoppers in the fall, such as lime, salt, or a mixture of both, used as a top dressing on pastures. Possibly a spraying of formalin and water might destroy those now living. The eggs are laid in September by the grasshoppers depositing them in small bunches of twenty or thirty eggs stuck together just below the surface. Skunks dig up great quantities of them in October. I opened a number of grasshoppers yesterday that seemed very large. Nine out of ten were filled with thread-worms, white, six inches long, which would seem to point out a possibility of the brutes dying soon. They are also infested with a bright red parasite. There are thousands of dead ones all over the meadows, but there would be no room for the living if some of them did not die. Naturally dry weather favours their increase, and as the last three summers have been dry we have had an extra hard crack from them. Matters are so serious with the farmers of the townships of Albemarle, Amabel and Keppel (in Grey) that I know many farmers will leave their farms, and many more would go if they could. We all thought last year would be the last of them, but the contrary was the case. Nobody cares to venture an opinion about next year now.
>
> "As the grasshopper dies in the fall, the remedy appears to lie in getting after the eggs. The Criddle mixture, as recommended by one of the bulletins, does not work here; they won't eat it. They don't seem to eat anything which has been dosed with Paris green. I am sure the careful consideration of this matter will be most acceptable to all of us who are unfortunate enough to live in this district."

The Criddle mixture has been so often tried and found effective on a large scale in Manitoba and in many places in Ontario, that we are surprised to learn of its failure in this case. Mr. Criddle himself states that many applications of the mixture have been made this year and that it has proved entirely effective. It may be that some error was made in its preparation or mode of distribution.

The white worms found inside the bodies of some Grasshoppers are commonly called "Hair-snakes" (Gordius) and are well-known parasites of both crickets and grasshoppers. They evidently destroy large numbers, but amongst such hosts as above described, it would require an enormous army of the worms to appreciably reduce the swarms. Scarlet mites, the red parasites referred to, are also commonly to be found clinging to their hosts and helping to destroy them. The destruction of the egg masses by breaking up the soil in which they are laid is by far the best method of getting permanently rid of the pests.

INJURIOUS INSECTS OF QUEBEC, 1909.

By William Lochhead, Macdonald College, Que.

The season of 1909 was in many respects abnormal. Spring was tardy throughout the Province and the crops were sown later than usual, on account of the cold rains. Summer weather conditions also differed in different parts. On the Island of Montreal there were timely showers throughout the summer, so that the crops at no time suffered from drought. Over a large part of the Eastern Townships, however, little or no rain fell during June, July and August, and the late sown crops suffered from lack of water. In the latter part of August rains fell which interfered with and delayed the harvesting of the crops. The autumn has been unusually free from frost. Very few of the outside flowers were nipped by the frost until the 20th of October.

Orchard Pests.

Orchards in Quebec are not well looked after as a rule. The majority of them are not pruned regularly, and as a result, the trees have too many twigs and branches, and the excessive foliage does not allow of the proper access of sunlight. Such conditions are congenial for the development of Apple Scab and the Brown Rot of Plums. Spraying is a practice indulged in by but few, and these are the up-to-date fruit growers, usually active members of the Quebec Pomological Society, who make money out of their Fameuse and St. Lawrence apples.

Cultivation of the orchard is sadly neglected, consequently there is ample opportunity for the safe hibernation of the more injurious insects, such as the curculio and the codling moth.

The Codling Moth.—This is undoubtedly the worst insect pest of the apple. It causes an enormous loss in orchards over the entire Province, and one sees no hope of abatement until the people learn to take better care of their orchards; by pruning, spraying, cultivation and destruction of the rubbish. Much good could be done if practical demonstrations were carried on by the Government to show how and when to spray and the value of spraying. I believe the time is fast approaching when the people will be ready to profit greatly by such demonstrations, for Quebec is well adapted climatically for the growing of apples of superior quality. Its Fameuse apple is known most favourably in all the great markets.

In spite of all that has been written, the life-history of the codling moth is not well enough known to the average farmer and fruit-grower. We entomologists must keep hammering away year after year until the fruit-grower can fight this enemy successfully by taking advantage of the weak spots in its life-history.

In Southern Quebec, including the border counties, there is in all probability a partial second brood; and it is the worms of this second brood that produce the wormy apples late in the season. The fruit may be entered at any point, and often an ugly scar is made on the surface, by the larvæ. A thorough spraying with lead arsenate just as the petals have fallen, and another application ten days or two weeks later should kill the great majority of the first brood. To intercept the larvæ that escape these two treatments it would be advisable to apply a burlap bandage about the trunk in late June. The worms in escaping from the fruit find the burlap a convenient place to hide and to spin cocoons. To prevent the small portions that pass through a partial brood from doing injury the burlaps should be removed every ten days, and replaced after all larvæ and cocoons have been destroyed.

THE BUD MOTH. This enemy of the apple was quite prevalent about Abbotsford, and perhaps in other localities.

THE OYSTER-SHELL SCALE OR BARK LOUSE. As one would naturally expect, Oyster-shell Scale is quite prevalent in the apple orchards of Quebec. This insect may be looked upon as the enemy of half-tended and neglected orchards. It is not a difficult insect to control, yet it does annually a great amount of damage. Many owners of orchards when asked if the Oyster-shell Scale is present in their orchard will state that they are not acquainted with it. They have not yet come to recognize it as an insect and as a serious enemy. The insect passes the winter in the egg state under the gray-brown, oyster-shaped scales on the bark of the twigs and branches. The eggs hatch early in June; the yellowish lice crawl about for a few days and then settle and secrete a scale over themselves. There is but one brood each season.

An application of whitewash to the trunk and large branches during the winter will remove the scales and leave the branches clean in the spring.

THE APPLE APHIS. This insect was reported as abundant about Abbotsford, and in the Montmagny and Kamouraska districts below Quebec. It was observed on some of the trees in the young orchard at Macdonald College.

THE AMERICAN TENT CATERPILLAR. This insect, which was so abundant and injurious a few years ago, was again in evidence in many localities. It would be advisable for farmers to be on the look-out for the ring-like clusters of egg masses which encircle the twigs of apple and other trees during the fall and winter months, and to destroy them.

THE PLUM CURCULIO. Curculios were very prevalent in Quebec orchards in 1909. In some orchards a large percentage of the apples were deformed by the numerous curculio punctures, and were rendered practically useless. This widespread injury to the apple crop demands attention; this note is written with this purpose in view, and at the same time to outline concisely our knowledge of the habits of this most destructive insect enemy of plums and apples, and the best remedies that are being used elsewhere to control it.

At the outset it may be said that this pest is no new enemy. For many years it has given more or less trouble to orchardists, making itself more conspicuous by its injuries some years than others.

There are probably two species of curculios that are responsible for the injury in our orchards. The *Plum Curculio* (Conotrachelus nenuphar, Herbst) and the *Apple Curculio* (Anthonomus quadrigibbus, Say). It is believed, however, that the former does the greater amount of injury, although no careful observations have been made in Quebec to determine their relative abundance.

The Plum Curculio is a native of America, and fed originally upon the wild plum, wild crab-apple, and the hawthorn. With the advent of the cultivated apple it took readily to the new fruit, which it continues to infest.

Life History. The adult curculio beetles winter over in rubbish on the ground, under bark and elsewhere, and emerge from their hiding places about the time the plums and apples are in blossom. The eggs are deposited within punctures partially surrounded by a crescent-shaped slit in the newly-formed apples and plums. The eggs hatch in less than a week and the larvæ proceed to make channels in the fruit. Infested fruit soon falls, and in about three weeks the mature larvæ emerge and enter the ground. There they pupate, and in about four weeks emerge as beetles. These soon fly to the fruit and continue feeding upon it, until the fruit is picked from the trees, marking it with the characteristic cylindrical punctures. As winter advances they hide themselves under rubbish and bark to hibernate until spring.

The adults that emerge in summer deposit no eggs, *all* the eggs being laid by the over-wintering beetles. The injury to apples is done mostly by the beetles that mature in summer, as they make deep punctures when they feed upon the fruit.

It is rather a strange thing that curculio larvæ develop only in small apples, and will not reach their development unless the apple has fallen.

A single mother curculio may deposit between 200 and 300 eggs, extending over a period of three months, hence is capable of doing a great deal of injury. This great egg-laying and puncturing power of the beetles explain the greatly distorted condition of many of the apples observed this year at Brome, Abbotsford, and elsewhere. In the great majority of apples examined there were as many feeding-punctures as egg-punctures. Not in every case did the eggs develop when deposited within the crescent-shaped mark, for we found many apples that showed the crescent slit but had no trace of larvæ.

Treatment. Observations made in Illinois and elsewhere show that uncultivated orchards suffer most from curculios, and our Quebec orchard conditions would favor drawing the same conclusion. And such is what we might naturally expect, for the conditions of the uncultivated orchard, with the excessive amount of grass and weeds and rubbish, and the absence of pruning, furnish ideal conditions for the development of the curculio. Besides, the proximity of neglected orchards is a menace to clean orchards.

There are four ways of treating the curculio:

1. *The destruction of fallen fruit,* so as to kill the larvæ before they make their escape into the ground. The *early small* apples should be specially looked after in June and July, for these contain a large percentage of the larvæ. The later and larger fallen fruit do not, as a rule, contain many larvæ.

The presence of hogs in an orchard is strongly recommended, if no other means can be found to clean up and destroy the fallen fruit.

2. *Suitable cultivation,* so as to destroy many of the larvæ and pupæ in the soil. It has been found that the larvæ and pupæ are extremely sensitive to physical disturbances of any kind, as well as to light and air. Cultivation permits their exposure, for a short time at least, to sunlight and to the attacks of their enemies, birds, ants, and predaceous insects. As a rule, orchardists prefer to cultivate up to the middle of July, but where curculios are doing much harm this cultivation should be continued for a month longer, in order to do effective work to the larvæ and pupæ in the soil.

3. *Spraying with Paris Green or Arsenate of Lead,* to destroy the adult beetles. This treatment has not given good results, and it is doubtful if the practice warrants the trouble and expense.

4. *Jarring the trees,* to collect the beetles that fall on sheets under the trees. This method also is slow, and it is doubtful if the practice warrants the trouble and expense, save with young apple trees and with plums and cherries.

FARM CROP INSECTS.

Grasshoppers and Blister Beetles. Grasshoppers and Blister Beetles appeared in alarming numbers in August and September in many districts of the Eastern Townships. The former swarmed in oat fields and the latter in clover and mangel fields, and considerable loss was incurred.

The increasing amount of permanent pasture land in Quebec furnishes undisturbed breeding grounds for grasshoppers. The eggs are laid in masses below the surface of the sod in late summer and early fall, and hatch the following spring. As a rule, the young grasshoppers are not numerous, and confine their attention to the pasture lands, but should conditions at any time favor their multiplication they spread to the adjacent grain fields where food is more plentiful. It has often been observed that grasshoppers are seldom abundant two years in succession. The reason for this is that their very great abundance allows their numerous enemies to multiply very rapidly. Among those enemies are:

(1) *Parasitic mites,* bright red creatures often seen at the bases of the wings, which not only suck the blood of their hosts, but also later destroy the egg masses.

(2) *Hair-worms,* which live within the bodies of the grasshoppers and destroy large numbers.

(3) *Tachina flies,* whose maggots live within the bodies of the grasshoppers.

(4) The young of *Blister beetles,* which devour the egg-masses in the ground.

(5) *Fungous diseases* that often spread with great rapidity.

It is quite probable, therefore, that grasshoppers will not be much in evidence next year, and that there will be a rest from their ravages for a few years.

It is possible to guard against such losses as have occurred this year, by watching the pasture lands, and if grasshoppers are very numerous, it would be advisable to make applications of poisoned bait in the pastures, if it is safe to do so, along the edges of adjacent grain fields. This poisoned bait may be made by mixing 1 pound of Paris green in 50 pounds of bran, made into a mash with water and sweetened with cheap molasses. This is distributed in handfuls to infested areas. In Manitoba a bait known as the Criddle Mixture is used with great success. It is made by mixing 1 part Paris green, 2 parts salt, and 100 parts of horse manure. Enough water is added to make a soft, not sloppy, mash. The mash is scattered over the field where the grasshoppers are thickest.

Black Blister Beetles, called by the farmers "Blue Beetles," were quite destructive this year on clover, mangels and beets.

They are often found feeding on other plants, such as the golden-rod, aster, pigweed, corn, beans and potatoes, and in the days before the arrival of the Colorado Beetle, this and allied species were the main insect enemies of the potato crop.

The adults are soft-bodied, with long, slender legs. They occur from August to October. The females deposit their eggs in the ground, and from these hatch out active, long-legged larvæ called "triungulius," that feed on the eggs of the grasshopper.

It will be observed, therefore, that while the adult Blister Beetles are injurious to some of our crops the young of these are decidedly beneficial. It is a difficult matter to decide sometimes whether it is advantageous to poison the adults, for if this is done there will be no larvæ to devour grasshopper eggs.

Should the adults become sufficiently injurious to warrant action, applications of Paris Green or arsenate of lead will readily kill them. On account of the abundance of grasshoppers this year, we may expect a large number of blister beetles next year.

Wireworms and White Grubs.

Among the list of injurious insects of farm crops, none perhaps surpass Wireworms and White Grubs, in the amount of damage inflicted. They work away unseen underneath the soil, and on this account are unknown to the casual observer. They are peculiarly the enemies of the careless farmer, and their presence indicates that something has not been done properly and at the right time. It may be that the pastures and meadows have been allowed to remain down too long; that a suitable rotation of crops is not practised; or that there is little or no fall plowing done.

Wireworms are the grubs of click-beetles or "skipjacks," and White Grubs are the grubs of June beetles, with which most persons are quite familiar.

Wireworms. The adult beetles appear frequently in the spring and the females deposit their eggs close to the roots of grasses or weeds. The Wireworms, however, do not confine their attacks to the roots of grasses and cereals, but often devour the roots of other crops and even the seeds of corn, wheat and other grains. In fact there is no plant that is immune from their attacks, so far as we know, although many farmers in England claim that buckwheat, mustard and rape escape. The Wireworms, of which there are many species, are hard, smooth, shining, yellowish-brown, wire-like grubs, and possess three pairs of short legs, hence they are readily identified.

Many attempts have been made to devise some reliable method of destroying them. Some years ago Professors Comstock and Slingerland, of the Cornell Agricultural Experiment Station, and Professor Forbes, of the Illinois Station, conducted a very complete series of experiments extending over a number of years, and found that insecticides were practically of no value. They ascertained, however, that certain cultural operations were valuable in destroying large numbers of the transforming pupæ and adults before they emerged from the cells in the ground. Wireworms spend from three to five years in the ground and transform to pupæ and adults in the late summer and autumn. But the adults remain in the pupal cells, and do not emerge until the following spring. It was determined that these pupæ and adults wintering in the pupal cells were very sensitive to distributions such as late plowing produces. Plowing infested or suspected sod-land twice—once in August, with a good harrowing a week later, and again in late September or October—will break up many of the pupal cells and expose the beetles during the winter to conditions which they cannot survive.

This cultural process will not interfere with the Wireworms or those in the grub stage. When a sod-land is broken there will naturally be Wireworms in different stages of development, some in the first year larval stage, some in the second year, and some in the third year, and others ready to pupate. Only those ready to pupate will in all likelihood be killed by the fall plowing. In the following season, however, the young grubs are growing rapidly; and if the dying roots of the sod furnish sufficient plant food, they will not do much feeding on the roots of the new crop, but will be more injurious the year following. Now certain crops, such as clover, barley, wheat and rye, are not so liable to attack as are corn, potatoes, mangels, oats; hence, they are better adapted to follow sod. Clover can be sown with barley and rye and plowed down after a cutting has been taken. This may be followed by corn or roots. Such a rotation will gradually exterminate the Wireworms, and furnish crops that give a good yield.

Short crop rotations will never allow Wireworms or White Grubs to make headway and develop, for there is too much disturbance of the soil and change of food plant. The best method of breeding these insects is to allow pastures to go unbroken for a series of years, for then conditions are particularly favourable for their development.

Sometimes it is possible to force the crops through an attack of Wireworms, by the application of mineral fertilizers to stimulate the plants.

White Grubs. White Grubs, as already stated, are the larvæ of June beetles, and are large, soft, whitish or yellowish grubs, with brown heads and three pairs of legs. The bodies are larger towards the hind end, and usually appear half-coiled. Like the Wireworms they require about three years to complete their development from egg to beetle. The adults appear in May and June, often in large numbers, to feed on the foliage of certain trees, such as plums, willows, etc., and to deposit eggs below the surface of the ground, usually on the roots of grasses and many other kinds of plants. The grubs on hatching begin to feed on the roots, and often do considerable damage. Dr. Forbes, of Illinois, who has given a great deal of study to White Grubs, is of the opinion that the grubs do not change to pupæ until June or July of the third season; that they change to beetles a few weeks later, but that these do not emerge from the pupal cells until the following spring. He is also able to identify several distinct species of Lachnosterna, of which *fusca* is the most common.

As with Wireworms, remedial measures are difficult. Special rotations are advisable. Fletcher says: "A short rotation in which clover follows grass or is grown at short intervals, will prevent the increase of these insects. In this special rotation the small grains should follow clover before corn or potatoes." When a field becomes infested with White Grubs a portion of the clover field, for example, might be broken and planted to corn instead of planting corn after timothy or grass. To make up for the deficiency of clover, that portion of the sod field which would have been devoted to corn could be sown with oats, vetches, etc., for green feed and hay. It is perfectly safe to put mangels, turnips and rape after old sod, although one will have to be on the guard against cutworms nipping off the young plants.

Cutworms and Flea-beetles. Considerable damage was done in June by cutworms on turnips, carrots and mangels, before they were detected, but the application of poisoned bait prevented further action.

In the Experimental Plots at Macdonald College the Wheat Aphis and the Wheat-Stem Maggot again made their appearance, but not in such numbers as in 1908. Flea-beetles were observed on some plots but they did no serious damage.

Root Maggots. These were numerous on many kinds of plants, viz., radish, cow-peas, soy beans, cabbage, onions and turnips, and caused considerable loss.

Cucumber Beetles. These appeared about June 10th at Macdonald College, and did more harm to squash than to cucumber, pumpkin or melon. Mr. Swaine reports that Bordeaux Mixture seemed effective, but they return to the new leaves and flowers.

Leaf Miners. Beets and spinach at Macdonald College were injured by leaf-miners. They attacked small leaves, and had practically disappeared by July 4th.

Currant Borer. (*Sesia tipuliformis, L.*). Mr. Swaine reported considerable injury to stems of both black and red currants. In some cases the stems were dying, and the leaves dried and discoloured. The larva bores in the pith sometimes for over six inches; it remains in the wood all winter, and in the following summer, in June, the bluish-black fly-like moth emerges to lay her eggs at the buds on the young wood.

Gooseberry Span-worm. (*Cymatophora ribearia,* Fitch). The moths were observed July 24th, not only on the gooseberries, but also on the currants, in the Macdonald College plantation. They fly readily in day-time when disturbed, and are attracted to light at night.

The larvæ or caterpillars are to be found in June; they are white, dotted with black, with yellow stripes about an inch in length when full grown. There is but one brood in a year; the eggs are deposited in July on the twigs, where they remain all winter.

This insect is capable of doing considerable injury to the leaves of gooseberry and currant. Arsenate of lead will control it.

Currant Aphis. (*Myzus ribis, L.*). The reddish blisters on the leaves of currants—the work of the currant aphis—were much in evidence in many Quebec plantations this past season. Inasmuch as the deformations interfered with the proper functioning of the leaves, considerable injury was undoubtedly done. Careful examination for the presence of aphids on the young leaves should be made, for it is much easier to kill the insects when they are few in number and before the leaves have become deformed, by applications of whale oil soap or kerosene emulsion solutions.

The Carrot Rust Fly. (*Psila rosæ*). This insect did considerable damage in some of the truck gardens about Montreal. Mr. Swaine received on July 14th, from McKinnon & Son, a package of small carrots which were riddled by the maggots of this insect.

The Fall Web-worm. The unsightly webs of the Fall Web-worm were very abundant both on forest, shade and fruit trees throughout the Province. Mr. J. M. Fisk, of Abbotsford, reports it as prevalent in his district, and Rev. Brother Liguori states that it was abundant at La Trappe.

ANISOTA VIRGINIENSIS, DRURY.

By Thomas W. Fyles, D.C.L.

Anisota virginiensis is one of the insects injurious to the oak. In some years its ravages are very apparent. I have succeeded this year (1909) in bringing its larvæ through their successive stages.

I had tried, on several previous occasions, to raise the species, but had failed. I attribute the failures to the fact that oak-spray, severed from the tree, dries very rapidly; and, as there were no oaks growing near my former residence, I could not keep the larvæ supplied with sufficiently tender food.

In my present place of abode I am better situated, as the White Oak, *Quercus alba,* is common in the neighbourhood. I have taken the precaution too, of placing every fresh supply of food for the Anisota under the water-tap, and drenching it thoroughly, before placing it in my insect breeding-cage. This plan has proved very successful.

A. virginiensis is widely distributed in the Province of Quebec. Mr. A. R. M. Boulton, President of the Quebec Branch of the Entomological Society has two specimens (♀ & ♀)that were taken, I believe, at Cape Tourment in Montmorency County. I have frequently met with larvæ of the kind on the Island of Orleans, and, on the 16th of last June, I found a beautiful male moth of the species, lying under an arc-light, near some oak trees, on Front Street, Hull. On the 29th of the same month, Miss M. G. Johnson, a member of the Entomological Society, sent me from Miranda, Missisquoi County, some oak-leaves laden with the eggs of the species, and also one of the moths that she had found laying the eggs, and a male of the same species.

The eggs lay close together, in broad patches which in several instances covered the under-side of the leaf—none were laid on the upper side. They were of a roseate light brown tint, but here and there was a pale green egg seemingly unfertilized.

The egg of *A. virginiensis* is globular in shape; but as the larva within advances in growth it becomes depressed, and loses its roseate tinge, till at length the little black-headed larva, snugly coiled, is plainly visible within the shell. The egg is one-twenty-fourth of an inch in diameter.

Doubtless the eggs sent me were deposited by several females of the same kind, and at slightly different intervals, for they hatched irregularly. The first of the young larvæ to appear left the shell the day after the eggs reached me—*i.e.*, on June 30th, and the others appeared at intervals for the next fortnight—consequently, some of them had reached the third stage while others were only in the first. In these notes I have followed the larvæ first hatched.

The newly-hatched larva was one-eighth of an inch in length. Its head was large in proportion to its body, and jet black. The mouth-organs were yellow. The body was yellow, and set with short spines. The legs were pale yellow and semi-translucent.

The larvæ are gregarious. They eat away the substance of the leaf, leaving only the mid-rib and some of the larger veins. When they have finished with one leaf, they proceed to another on the same twig, and, having stript it, they advance to a third, and so on—moving from leaf to leaf and from twig to twig.

The first moult took place on the 6th of July. After it the larva was a quarter of an inch long. Its head and fore-legs were black; its body was pale yellow; it had on the third segment two seven-jointed black horns. Along the middle of each of the following segments on the upper side was a row of small warts—each wart bearing a short bristle. A few white hairs extended from the black head. Towards the end of this stage in the larva's existence the segments of the body became more distinct and assumed a bluish green tint, with slightly darker longitudinal stripes.

The larva moulted again on the 14th of July. The old skin broke at the head to allow the larva to escape from it. When it made its fresh appearance the head, horns, anal segment and fore-legs of the larva were green, but they soon changed to black.

The body colour in this stage was sage green, with yellow sub-dorsal, side, and spiracular lines. There were several black, pointed tubercles along the middle of each segment, on the upper side. The spiracles were black. The black, glossy horns on the third segment extended beyond the head. There was a black granulated plate on the second segment, and before the horns on the third.

The larvæ again moulted on the 23rd of July. Their vacated skins were left in rows adhering to the mid-ribs of the leaves which they had skeletonized. Their body colour was now black. As in the previous moult the head, etc., were green at first, but soon changed to black. The whole body was firm and glossy. There was a double line of yellow along the back; and the sub-dorsal, side, and spiracular lines were yellow. There was a row of spike-like protuberances around the segments on the upper side—on the anal segment there was a cluster of such protuberances. In this stage the larvæ attained a length of one and one-sixth inches.

They moulted again on August the 4th. Their length after the moult was one inch and five-twelfths of an inch.

The larvæ reached their full growth by the second week in August. They were then two and a quarter inches long, cylindrical, glossy black with very conspicuous yellow lines. The spiracles were black. There was an oblong yellow spot over each of the prop-legs and a similar spot on either side of following segments. The thorny protuberances on the segments were well developed, and at the end of the body there was a cluster of such protuberances.

The larvæ began to enter the soil on the 10th of August; and before the end of it, all in my keeping had buried themselves; but, so late as the 13th of September, I found in the woods a solitary straggler of the species.

The pupa is finely sculptured. Its abdominal segments are boldly outlined; and from the last of them projects a stout spine forked at the end. This probably serves as a lever, to enable the chrysalis to work its way to the surface of the earth, when the imago within it is nearing perfection.

In rearing the larvæ of *A. virginiensis* two particulars drew my attention specially. One was that, in the later stages of their growth, some of the caterpillars were *much smaller* than the others. In the final stage the smaller ones were only two-thirds the size of the larger. I should say that these were the undeveloped males, for the male moths of the species *are much smaller* than the females.

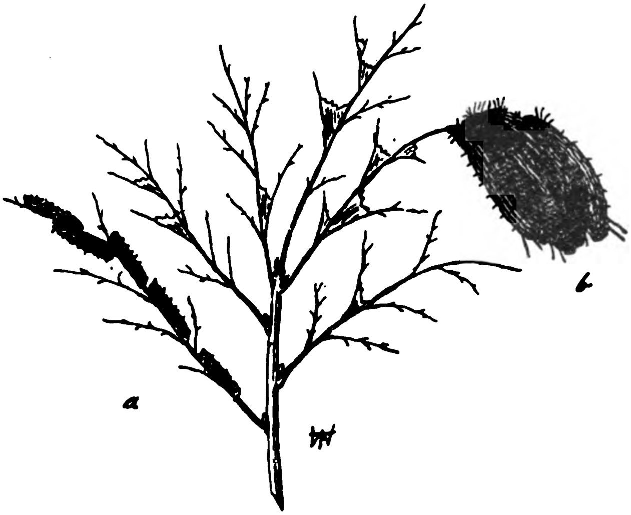

FIG. 11. Oak leaves skeletonized by *Anisota virginiensis*: (*a*) vacated skins of larvæ; (*b*) Larvæ bunched together for mutual protection.

The other particular was, that the larvæ in their later stages, had the habit of grouping themselves into clusters at the ends of the mid-ribs of the leaves which they had skeletonized. In these positions they somewhat resembled the small webs, that, in August, are so frequently to be seen on forest trees. (Fig. 11).

ADAPTATIONS IN THE STRUCTURE OF INSECTS.

BY REV. THOMAS W. FYLES, D.C.L.

On a certain occasion last summer, a friend of mine was standing on a bridge, which spanned a shallow creek that had a muddy bottom. His attention was taken by the proceedings of a large dragon-fly that was hovering close to the surface of the sluggish stream, at the shallowest part of it. The insect repeatedly thrust its abdomen down through the water, and into the mud. My friend could see the slight disturbance in the mud as the point of the insect's abdomen entered it and was again withdrawn. The fly was depositing its eggs. Here then was revealed one reason why the dragon-fly has so lengthy a tail.

It is interesting to see one of the "Demoiselles"—AGRIONIDAE—alight on a floating leaf of a Pond Lily, and bend its long abdomen round the edge of the leaf to affix its eggs on the under side—the side in contact with the water.

The perfect fitness of every part of an insect for the functions it has to serve will always be admired by the inquiring and thoughtful observer.

In our early lessons in Entomology certain facts were impressed upon our mind, viz.—that an insect is a creature that is cut into or notched; that the notches mark out the head, the thorax, and the abdomen; that the insect passes through four stages of existence—the *Egg,* the *Larval,* the *Pupal* and the *Imago* stages.

In this short article I purpose to offer a few desultory remarks on the several features of the insect form, and on the several stages of insect life—endeavouring to show the admirable fitness of the insect to meet, at all times, the exigencies and requirements of its existence.

THE HEAD. In the head of an insect the striking and important features are the eyes, the mouth organs, and the antennæ.

In the larger dragon-flies (Fig. 12), such as those in the genera Æshna and Anax—insects of extremely rapid flight—the eyes occupy the main portion of the head space. The huge compound eyes of *Anax junius* are contiguous; yet they allow room for three ocelli. Nothing seems to escape the glance of these splendid insects; and in the bright sunshine, when they are most active, the ease with which they evade the sweep of the net of the entomologist, though it may be provoking to the sportsman, must nevertheless awaken his admiration.

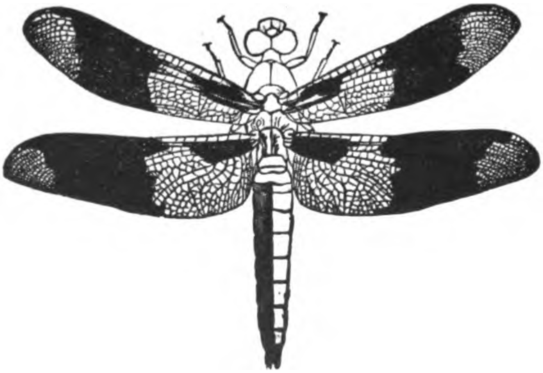

FIG. 12. Dragon Fly.

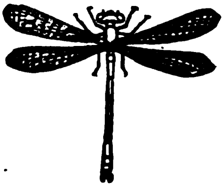

FIG. 13. Damsel Fly.

In the AGRIONIDOE or Damsel-flies (Fig. 13),—insects of less rapid flight—which can take a more leisurely view of things—the head, as Wood remarks,*

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* "Insects at Home," page 275.

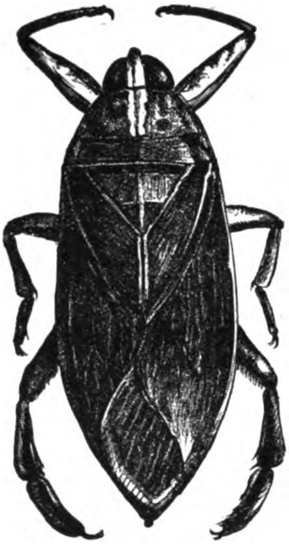

FIG. 14. Giant Water Bug.

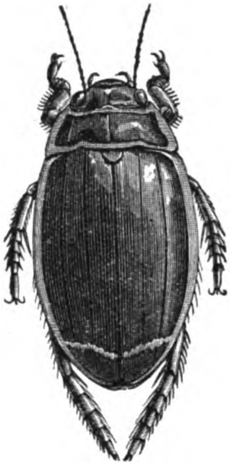

FIG. 15. Diving Beetle.

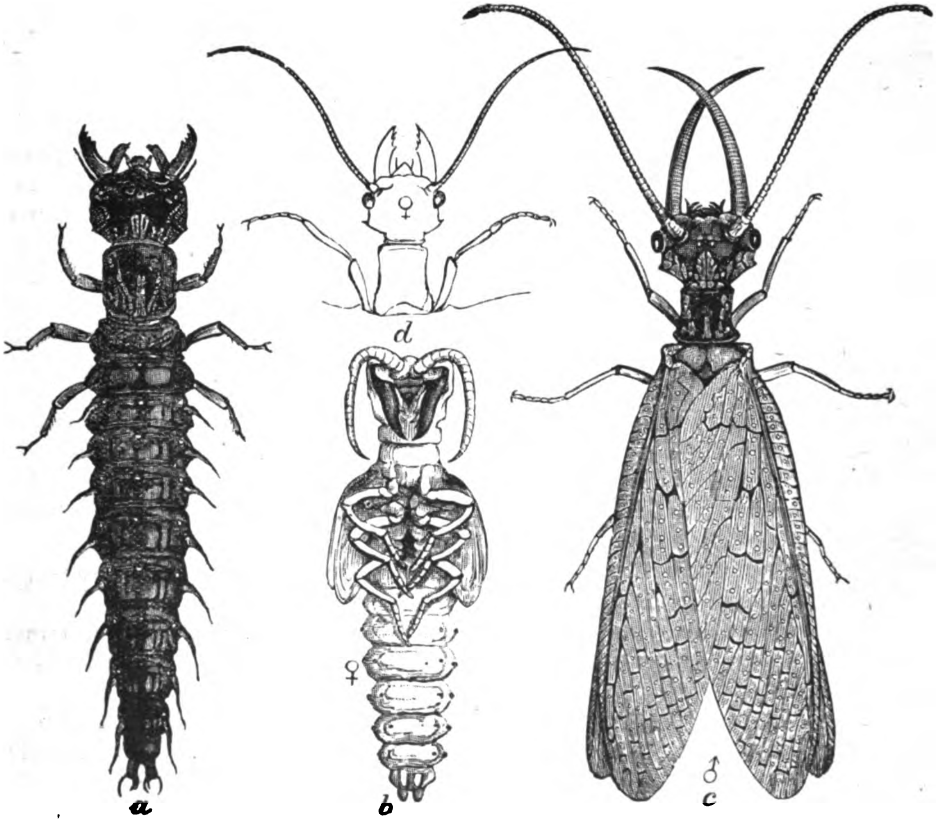

FIG. 16. Giant Water Fly (Corydalis cornutus), (*a*) larva; (*b*) pupa; (*c*) male fly; (*d*) head of female fly.

reminds one of that of the Hammer-headed Shark; and the eyes project from the sides of it. These dragon-flies, like others of the Odonata, can turn their heads half round on the neck, and so look over their shoulders.

Another insect with large and protruding eyes is the Giant Water Bug, *Belostoma Americana* (Fig. 14). So far do the eyes of this insect protrude one might almost expect that, in the wild dashes of the insect through the upper air, and into and under the water, they would be swept from their position. But a remarkable provision prevents the danger; from the centre of the saucer-like eye-socket arises a stout support, flattened out a little at the top—somewhat spool-shaped—and around this the eyelets of the compound eye are compressed. (Fig. 15).

In the Diving Beetle, *Dytiscus Harrisii* (Fig. 15), an insect of very similar habits to *B. Americana,* the eye is so placed in the side of the head that the creature can see both above and below; and the organ is protected by a curved extension of the pro-thoracic shield.

The like protection is afforded to the eye in water-beetles of other genera—Hydrocharis, Colymbetes, Acilius, etc., while in Dineutes the eye appears to pass through the substance of the head, so that the insect seems to have four eyes—two above and two below.

That widely different and very minute insect the White Fly of the greenhouse appears to have eyes similarly arranged to those of Dineutes. In the fly the eyes appear as two black dots above, and two black dots beneath the head.

The mouth organs of insects vary considerably to suit their different habits. There is a striking difference in the mandibles of the male and female imagos of the Giant Water Fly, *Corydalis cornutus* (Fig. 16). This is the more remarkable because in the larval and pupal stages of the sexes the organs apparently are alike. Some years ago I traced the life-history of this species through its metamorphoses. I saw the nymph draw itself about in its cyst, by means of its formidable mandibles; and I expected that, when the change to the imago came, the insect would prove to be a female; but lo, when it came, and the imago burst from the nymphal case, the mandibles were extended (I presume by inflation) into the preposterous organs we see in the male. Why is this difference between the male and the female mandibles? It is that the male may be able to give a loving embrace to the well-defended neck of its mate.

How strangely the lips and jaws of the dragon-fly work, in masticating its food, as if they were at cross purposes, the lips perpendicularly, the jaws horizontally—they are two pairs of very effective cutting knives.

Belostoma Americana lives by sucking the life-fluids of its prey, and is furnished with a stout beak-like proboscis, about a quarter of an inch long. This proboscis consists of an outer pointed case, having a longitudinal slit in front, and of an awl-shaped sucking instrument enclosed in a divided sheath barbed at the extremity. It is a formidable weapon.

The bug clings, by means of its powerful front legs, which are terminated with sharp claws, to the fish or other creature that it assails, and thrusts its proboscis into its victim.

The Reduviidæ, or "Assassin Bugs," are furnished with beaks of like construction. The stories told us of the "Kissing Bug" have led us to understand how dangerous, under some circumstances, these weapons may become.

The proboscis of the House Fly is terminated by two ridged valves with which the insect scrapes up its food. Those who have volumes bound in sheep-skin, and exposed in open cases, will soon find, from the roughness and loss of gloss in the binding, that the flies have been at work upon the dressing of the leather.

How different, and how wonderful, are the trunks of the nectar-sipping moths and butterflies! They lie curled up so compactly within the sheltering palpi, and can be extended so far when occasion requires. The length of the proboscis in these cases enables the insect to take its food, as it hovers over the blossoms, without injury to its wings.

Of the purposes served by the antennæ of insects we know but little; but it is obvious that they are fitted to the requirements of the species they adorn; the bee, which enters blossoms in search of pollen and nectar would find antennæ like those of *Paniscus geminatus* unmanageable and entangling; and *Geotrupes Blackburnii,* would have difficulty in delving in the earth, if it were burdened with antennæ like those of *Monohammus titillator.*

THE THORAX. To the thorax of insects are attached the legs and wings.

Passing amongst the Golden Rod, this Fall, I came across three species of insects that secure their prey by means of their fore-legs, viz.—*Mantispa brunnea* (Fig. 17), *Acholla multispinosa,* and *Phymata erosa.*

Like the Praying Mantis of which Hood speaks, in his "Ode to Rae Wilson, Esq.," as—

"An insect, of what clime I can't determine,
That lifts its paws most parson-like, and thence,
By simple savages—through sheer pretence—
Is reckoned quite a saint amongst the vermin,"

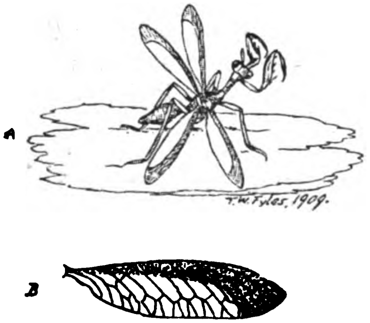

FIG. 17. (*a*) Mantispa brunnea; (*b*) Wing of M. brunnea much enlarged to show the venation.

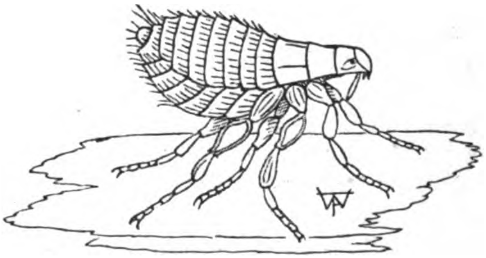

FIG. 18. Bat Flea.

so, *Mantispa brunnea* lifts its paws, with sweet "petitionary grace," lying in wait amongst the flowers. When *Argynnis myrina,* or some other incautious innocent butterfly comes within its reach, *M. brunnea* secures it with its outstretched arms—which are truly arms of offence.

Acholla multispinosa is a creature of like habits to *M. brunnea;* and its fore limbs are set thickly with sharp spines (hence the name), which enable it the more readily to secure its prey.

But the most remarkable of the three species is, I think, *Phymata erosa.* This insect in its colours closely resembles the flowers of the Golden Rod in which it lies in wait. On occasion, the tarsi of its extended fore-legs spring back into a toothed groove in the large and powerful tibiæ, and hold a captive as in a vice.

In *Dytiscus Harrisii* the upper portion of the foot in each of the fore-legs is expanded into a disk or pad, supplied on the under surface, with suckers which exhaust the air, so that the insect can attach itself firmly where it is inclined.

These appendages are not found in the female. Moreover, while the male Dytiscus is remarkably smooth and slippery, the female is roughened with striæ.

In *Acilius fraternus* a like provision is found in the foot of the male, to that in the foot of the male Dytiscus; and in this species also the female has roughened elytra.

The powerful hind limbs of the insects that have been named SALTATORES, such as the crickets and locusts, are worthy of observation. But other insects beside these Orthoptera have great powers of leaping:—

On the 24th of May of this year I was sitting on the veranda of Mr. Garrioch's house, on Front Street, Hull, when I saw a bat fall from a tree on the lawn. The little animal was in a very weak condition. While I was examining it I saw a flea creep from the fur, and then bound upwards one hundred times its own height. (If an acrobat could leap 600 feet into the air, he would draw multitudes to witness the feat.) (Fig. 18.)

I put the bat in a box, and obtained from it *thirteen* other specimens of the same kind of flea. No wonder the little animal was in a weak condition.

This *Pulex vespertilionis* was different from *P. irritans* and *P. serraticeps*. It was about two millimetres long. Its dorsal parts were of a light chestnut colour, and its ventral parts of a pale amber. The legs were translucent. The trocanters were grooved. The femur in each of the middle and hindmost legs was large, flat, and cleaver-shaped. Around it, near the edges, was a slight indentation. The tibia was striated and bristly. The tarsus had five joints with two bristles at each joint. The abdomen was hairy.

Of the wings of insects, fine examples of venation are afforded by the water-flies *Pteronarcys proteus* and *Polystoechotes punctata;* of elegance of form by *Actias luna and Hyloicus chersis*—and of splendour of colouring by *Philampelus achemon* and *Plusia balluca.*

THE ABDOMEN. How great a difference there is between the telescopic ovipositor of the house-fly which is concealed in the abdomen of the insect, but can be extruded by pressure, and which is fitted to penetrate the manure from the stable in which the larvæ of the fly luxuriate—and that of *Thalessa lunata,* which in some instances extends for four inches beyond the extremity of the abdomen, and is fitted to be passed along the tunnel, choked with frass, at the end of which the larva of *Tremex columba* is working. The young larva of Thalessa follows up and preys upon the larva of the Tremex.

The ovipositor of the last named insect proceeds from the middle of its abdomen, and not from the end. It is shorter and stouter than that of Thalessa, and is adapted to penetrate the bark and white wood of the trees suitable for the sustenance of the larvæ of its species.

THE EGG. Some years ago I found a huge boulder in a swampy wilderness. In a slight hollow, in the top of this, some vegetable mould had accumulated; and a thick pad of moss covered it. On lifting the moss, I found some hundreds of eggs of the Red-legged Locusts packed together in the soil. The locusts had found in the position a suitable nursery for their young.

The life of the Day-fly is very brief—as its name implies. It does not allow much time for oviposition. One act of extrusion consigns its eggs, in a boat-shaped mass, to the surface of the water.

The Cockroach frequents the house, but is highly objectionable to the housekeeper. Its eggs are laid in brown packages—oöthecœ—in the crevices about the kitchen-ranges and the cellar-furnaces. In these they escape notice.

The ovipositor of the Domestic Cricket has a divided sheath—each half of it having a spoon-shaped termination. When closed these terminals hold the egg, as in a casket, till a fitting nook for its deposit is reached; and then, they open and discharge it.

The cat shakes the eggs of the fleas that infest it into the lap of its mistress, or upon the rug on which it sleeps. The larvæ of *Pulex serraticeps* feed upon the particles of food that they find in the cracks of the flooring of the dwelling-place—but if the sheep-tick were to lay eggs that could be shaken from the wool of the sheep, her progeny would perish. Against such a contingency she retains her young till it reaches the pupal stage. The abdomen of the tick is unsegmented, and vellumy, and therefore very strong.

THE LARVA. The resemblance by which some species of Lepidopterous larvæ deceive their foes, and the threatening attitudes assumed by others, to drive their enemies away, are very familiar to all of us. But the very remarkable provision for the safety of the larvæ of *Harrisimemna trisignata* is not so well known.

And here we must call to mind that many caterpillars—those of *H. trisignata* among them—when undergoing the usual moult, withdraw the head from its old case, at its junction with the second segment—at the neck-opening—as a knight of old withdrew his head from the helmet. I raised a brood of larvæ of *Anisota virginiensis* last season. With them the head case was hard and black; but the head when it was withdrawn was soft and green. However, it speedily became rigid and dark as before.

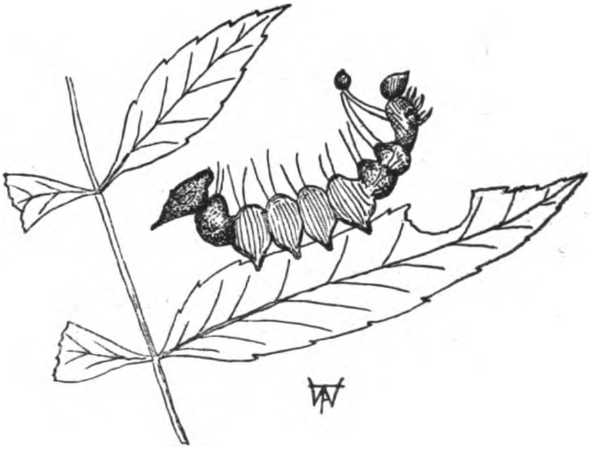

FIG. 19. Harrisimemna trisignata. (Walker).

Now in the case of the grotesque larva of *H. trisignata* (Fig. 19)) on the thoracic segments there are some long stiff hairs which seem to have lain under the skin before the previous moult, and to have been attached, by their tips, to the inner side of the head cover. When the change of skin took place the hairs were erected, retaining their hold upon the head-case. At the slightest disturbance the larva agitated the bristles and the attached case. is swung backwards and forwards with great rapidity.

I raised this insect some years ago, and subsequent observation has convinced me that we may see in this a natural provision, to protect the larva from troublesome ichneumons.

Cassida viridis appeared in this country a few years ago. It feeds on the Burdock and lies exposed on the plant. A curious provision is made to preserve the larva from the heat of the sun, and to render it unattractive to predacious insects and birds. By a fork-like appendage to the anal segment, the *fæces* are retained and supported over the dorsal parts of the larva, and form a protective wad, or shield.

THE PUPA. In the month of September, larvæ of the Saw-fly, *Cimbex Americana*, may sometimes be seen curled up, helix-fashion, on the ground, under the trees on which they fed. It will generally be found that they are parasitized—victims of *Opheltes glaucopterus*. They may have strength remaining to enable them to creep into some retreat; they may even attempt to spin the cocoon in which under normal conditions, they would spend the winter months; but they fail. Within them is the foe that is exhausting their vitality. This creature undergoes the pupal change within the frame of its host, and, at length, bursts from it as a perfect fly.

The fine ichneumon *Trogus fulvipes* undergoes the pupal stage within the pupa of the beautiful butterfly *Papilio troilus*.

I may cite the following as a remarkable instance of the instinct of a larva about to undergo the pupal change:—There was a needle-book, formed of alternate leaves of white and golden flannel, lying open on a shelf in my study. One night a larva of *Samia cecropia* escaped from the box in which it had been brought to me, and disappeared. Sometime afterwards I found that it had spun a cocoon in the needle-book, and had fastened a white fold on one side of its cocoon, and a yellow fold on the other. To disguise its work more effectually it had secured in the meshes of the cocoon, frayings of the white flannel on the one side, and frayings of the yellow on the other.

Volumes might be written upon the adaptations in structure which fit the insect for its environment, which enable it to supply its wants, and which ensure the perpetuation of its species. The Naturalist delights to look into these things. Considering them he feels, as David felt, that the Divine Designer of the Universe "hath so done His marvellous works that they ought to be had in remembrance."

"The melancholy days" have now come—"the saddest of the year;" but we still can find pupæ of insects in their snug retreats; and we know that, when "Heaven shall repair her rural seat," objects of beauty will burst from cocoon and chrysalis, to gladden the hearts of the beholders.

THE ACARINA, WITH A HOST INDEX TO THE SPECIES FOUND IN ONTARIO.

BY TENNYSON D. JARVIS, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

There is probably no more widely distributed order of Arthropods than the Acarina; in economic importance there is none of greater value; and within the range of the whole animal kingdom there is no study so varied and fascinating as that of the Acarids, commonly termed Mites. The relation of these to other Arthropods has never been clearly defined, but in many respects they bear a close resemblance to Spiders and Scorpions in the Arachnida, and by the best authorities have been put in one order of this class.

However, in structure they are so unlike and in habits they are so varied that one never loses interest in his researches. Perhaps one of the most interesting features in the study of mites is shown in the manner in which they protect themselves against their enemies by special adaptations. The species belonging to the genus Nothrus are found on the bark of spruce and pine and appear in colour and shape like tiny bits of bark and lichen. A species of Analgesid, found on the wings of the Baltimore Oriole, presents precisely the same shade as the feathers of the wing. *Tetranychus spinosa,* which feeds in the upper surface of the leaf of the basswood, is identically the same colour as the leaf, and the writer found it impossible to detect the difference except by use of the microscope.

In the Gall Mite family the young mites are almost as translucent as are the trichomes, but when with age these trichomes turn brown and then black, the mites also assume the same colours in the same manner. Any number of similar examples might be mentioned if space permitted, but sufficient has been said to indicate the adaptation of these animals to their colour environment. Another species of Nothrus may be mentioned as demonstrating protection from dryness and heat. In this case the mite accumulates a covering of dust upon its back. Similarly at the approach of cold, the mite surrounds itself with particles of any substance within reach. Further illustrations of adaptation to environment are seen in a species of mite found upon the roots of Yarrow, with legs broadened, mole-like, fitting it for digging and burrowing in the earth. In the genus Cheyletus, the palpi are large and branched, fitted for grasping, and the mouth parts are long and piercing, providing the mite with suitable weapons for a predaceous life. Aquatic species are greatly modified forms of land mites, with flat and hairy legs, enabling the mite to propel himself quite freely in the water. The parasitic mites attacking all kind of animals have many special devices for attaching themselves to their host and adequate provision for obtaining nourishment from the body of the victim.

The curious shapes and odd looking appendages found in many of these creatures appear to the observer to be more ornamental than useful. The bird mites with their angular construction and long tail-like appendages afford the best examples of this class. The sugar mite *Glyciphagus* with its fan-like attachments is another instance of apparently useless equipment.

In richness of colour and beauty of marking, the Tetranychids and Analgesids are most noticeable. Indeed, some of these handsome species are worthy of the attention of any one interested in the field of Nature. Among the most remarkable phases of animal architecture are the abnormal constructions of vegetable tissues produced by species belonging to the family Eriophyidæ. About seventy different species of these worm-like creatures inhabit trees, shrubs and herbs of Ontario flora.

Not the least wonderful of the habits exhibited by the Acarids are their modes of distribution. As will be shown in our discussion of the dung beetles, many species of the scavenger mites make use of dung beetles and flies to bear them to new feeding grounds. A few species are specially provided with a cord, secreted by glands in the body, by means of which they fasten themselves to their carriers.

Another interesting feature in this connection is their friendship to other animals, a few species sharing the home of many of the common species of ants. Here we find the ants repaid for their hospitality to the homeless mites by having their quarters kept in cleanly condition by getting rid of the cast-off skins which are largely devoured by these active little scavengers.

Because of their relation to disease, their parasitic habits upon man, animals and plants, and their beneficial effects as scavengers, it is hard to over-estimate their importance. There are at least eight well-defined diseases of man and domestic animals, all isolated within the brief period of five years, which are transmitted from host to host by means of these mites. Numerous species spread the spores of bacterial and fungous diseases from affected organisms to healthy plants. As animal parasites they are found upon insects, crustaceans, mollusks, fishes, amphibians, reptiles, turtles, birds and mammals. As plant parasites, almost every known plant is attacked by one or more of these hungry mites; and as scavengers they are found on all decaying matter. In spite of their vast importance, not much has hitherto been done in Canada in working out the different species and determining their habits. This is in part due to their very minute size and also to the difficulty in locating them. For the little we do know, we are indebted to Mr. J. B. Tyrrell, of Ottawa, for his investigations on Analgesids, and to the late Dr. Fletcher for his contributions on the habits of some of our common species of vegetable pests. In the United States much has been done in a systematic way by Mr. Nathan Banks, Bureau of Entomology, Washington.

The species in the list outlined in this report were in almost every case collected in the vicinity of Guelph. This study was first taken up in 1904 and since that time the writer has collected, examined and studied to some extent the habits and characteristics of upwards of three hundred species, one hundred or more of which are new and many of them belonging to genera new to North America.

Mites are known to exist and to cause trouble in every part of the world, but in the temperate zones the largest numbers of species abound. Usually they are found in semi-dark localities, but a few species seem to enjoy full sunlight, being found upon the upper surface of leaves. On account of their minute size, certain species can be obtained only by use of special devices, such as mite traps; others again, such as bird mites, which are nocturnal in habits, must be gathered at night; still others, as the Eriophyes, which closely resemble their surroundings, require several days of constant search. Special emphasis should be laid upon the construction and operation of the mite traps. The trap consists of a copper cone-shaped vessel lined with tin, affording a smooth surface, to prevent the mites from attaching themselves to the sides of the cones. Within the body of the outer cone are four smaller cones, to the ends of which are attached small bottles, and in these the material under examination is placed. The outer vessel is then filled with water at a temperature much higher than the normal habitat of the mites. The discomfort thus produced causes the mites to leave their host or habitat, and as almost without exception, Arthropods when disturbed travel downwards, they slide down the smooth inner surface of the cone into the bottle below, where they are readily available for examination. Sometimes they are preserved in alcohol, sometimes mounted in glycerine jelly or balsam, and if intended for life history study they are transferred to artificial media.

The aquatic apparatus is made of the same materials as the terrestrial one, viz., tin and copper. It works upon much the same principle as the one just described, *i.e.*, when an Acarid becomes uncomfortable the tendency is to go downwards. But instead of applying heat as in the case of the land trap, a few drops of formalin or alcohol is added to the aquatic material. The trap with the proper fittings may be taken to a pond or stream where various kinds of material are available, and in the course of a single day's work many species may be captured.

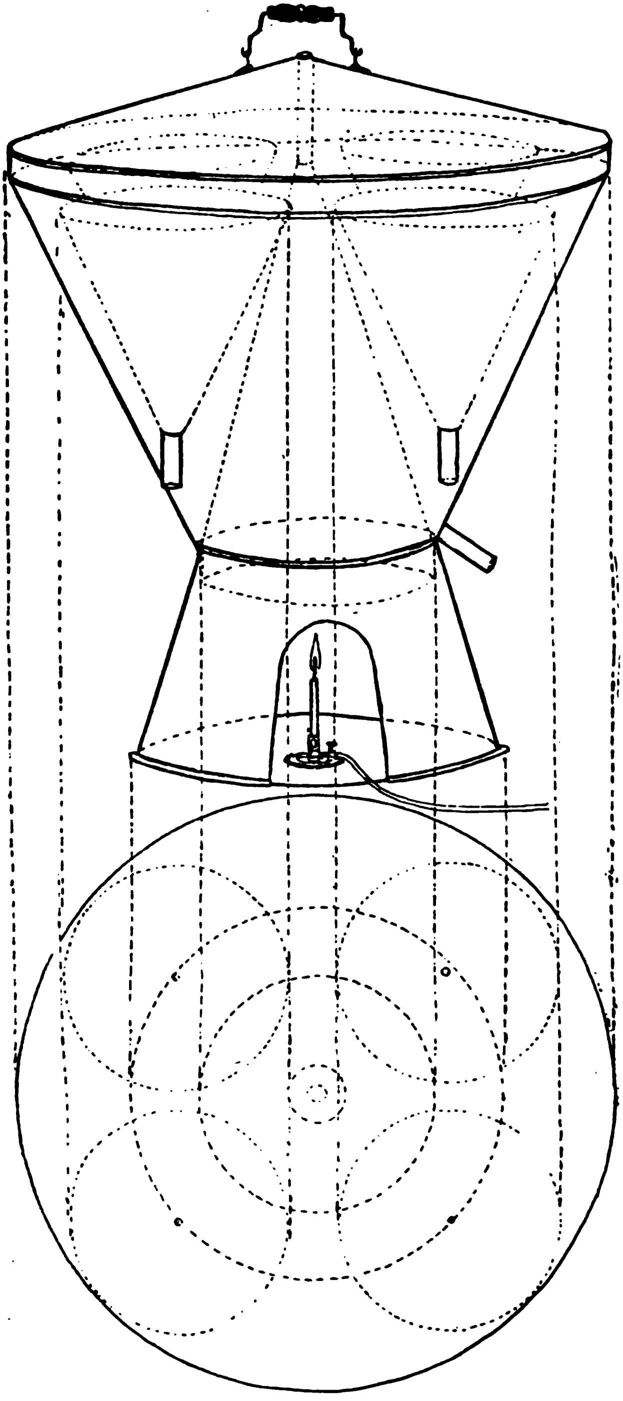

FIG. 20. Apparatus for collecting small terrestrial Arthropods.

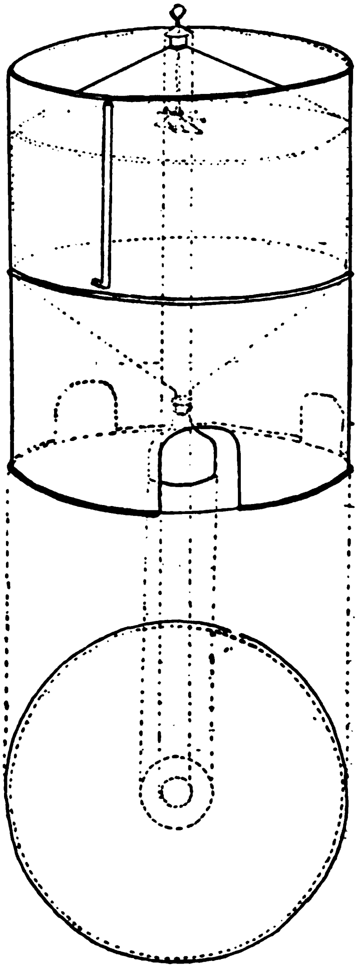

FIG. 21. Apparatus for collecting small aquatic Arthropods.

At the College over one thousand kinds of material were examined and almost all were found to contain one or more species of mite, in some cases as many as twelve different species were procured from a single substance. To give some idea of the kinds of materials tested, we might mention the following: manure, moss, decaying vegetables and leaves, dead and living animals, herbaceous plants, bark and leaves of trees, tubers, bulbs and roots, bone, stone, nests of birds and mammals, soil, pine and spruce cones, ensilage, fleshy fungi, all kinds of grocery commodities, clothing, fruits of all kinds, and sawdust.

Some of the living mites obtained from the mite machines were transferred to pure cultures in order to study their habits and life history. It was found that on proper media it was possible to keep them alive through several generations. Some of the media used are as follows:—First, for living animals—mosquito pupa extract and beef peptone. For living plants—extract of the same plant and on the living host plant. The extract of the plant was made by using two parts by weight of water to one of plant material, and the two heated one hour in a sterilizer and filtered. For mites living on dead matter, the cultures were made in three ways, first, for mites living in nitrogenous substances the culture consisted of whey-peptone, whey 80 per cent., agar 10 per cent., and gelatin 10 per cent. Two other cultures for the nitrogenous feeders were cheese extract and beef extract. On saccharine and acid fruits the media consisted of apple juice. On vegetable matter a culture of potatoes and potato extract gave best results.

The gratitude of the writer cannot be too strongly expressed to Mr. Nathan Banks, Acarologist of the Bureau of Entomology, Washington, for his able and ready assistance in identifying a large number of species sent to him, and to Messrs. W. R. Thompson, B. Barlow, George Chadwick, Geological Hall, Albany, N.Y., and Dr. Bethune, for assistance rendered in various ways.

I.—HABITS OF THE CLASS ACARINA AS AGENTS IN THE TRANSMISSION OF DISEASE.

Spread of Bacterial and Fungous Diseases.

In pathological and bacteriological laboratories, mites are a great nuisance by inoculating pure cultures. Four species were found at the Ontario Agricultural College,—*Tyroglyphus Americanus* and *T. longior* feeding upon non-nitrogenous media, and *Cheyletes clavispinus* and *C. longipes* feeding on nitrogenous cultures. They make their home in the incubators, and gain entrance to the pure cultures through the cotton wool in the test tubes and between the fittings of the Petri dishes. The spores of bacteria and moulds attached to the appendages of the mites are left behind in the pure cultures, where they multiply rapidly and cause no end of trouble.

The spread of bacteria and moulds in root houses is not duly appreciated. More than a dozen species have been found at Guelph inhabiting turnips, beets, carrots, mangels, parsnips, potatoes, spreading spores of affected roots to healthy ones. Especially noticed in cellars of this kind are *Galumna moesta, Rhizoglphus phylloxerae* and *G. depressa* on turnips; *Oribatta depressa* and *T longior* on mangels and turnips, and *Gamasus* species on sugar beets and on parsnips, potatoes, celery, etc. On fruit trees the spread of brown rot, cankers, pear blight, etc., are carried to a large extent by such species as *Tetranychus telarius, T. bicolor, Bryobia pratensis, Oribatella pallida,* and *O. formosa.*

Here it might be mentioned that the fruit grower may do much in the way of avoiding diseases of the kind mentioned by frequent applications of the common insecticides.

In Grocery stores cleanliness cannot be too strongly emphasized, as this is one of the favourite resorts of mites. A few examples of the spread of bacteria and fungi will give an idea of their destructive habits to the groceryman. They crawl underneath the lids of manufactured jams and jellies, carrying with them spores which multiply and bring about putrefaction. In dried fruits, sugar, and other sweets, flour, bread, cheese, etc., they carry a number of species of moulds and often cause tremendous loss, which might easily be avoided if the proper care were practised. *T. longior, T. Americanus, Aleurobus forinae, Carpoglyphus sp.* are examples of Grocery pests.

In horse stables and other buildings, mites are found abundantly, especially where imperfect lighting and cracks and crevices of concealment are features of the buildings. *T. longior* might be mentioned as the commonest house mite. It is found from cellar to attic and practically on every object, thus we see the probability of its spreading spores of bacteria and fungi. The ensilage mite which makes its home in the silo is a good example of a stable mite. It, no doubt, spreads spores of some of the numerous bacteria and fungi found in ensilage. Another example of how mites may spread disease from stable to house is the case of the house-fly mite which travels on the backs of flies and may be transported from the manure of the stable to the food in the pantry, *e.g., Histiostoma Muscarum.*

SPREAD OF PROTOZOAN DISEASES. Nearly all of the diseases belonging to the genus Piroplasma are transmitted from animal to animal by means of these ticks or mites. In the United States there are two very well known pathogenic diseases which belong to this group. The Texas Fever (*Piroplasma bigeminum*) and Spotted Rocky Mountain Fever (*Piroplasma sp.*) In Asia and Africa six other well known diseases, *Piroplasma ovis* of sheep, *P. canis* known as Piroplasmosis of dogs, *P. equi,* Piroplasmosis of the horse, *Piroplasma Sp.*—Rhodesia fever, and *Haemoglobinurina* of Finland. Space will not permit of discussion of this important phase of the subject. At present we have no record of any diseases spread in this manner in Canada, but since we have here numerous species of ticks associated with animals it is not unlikely that in time we shall find examples of diseases carried in this way.

AS PARASITES OF ANIMALS.

MAN.—Among the mites that are injurious to man might be mentioned, first, those that are parasitic and spend the whole of their existence in the host; second, those like the ticks that are casual visitors; and, third, those that inhabit his house and clothing and cause annoyance by their presence. The first is exemplified in the follicle mite which lives on the secretions of the follicles of the skin, such as *Demodex folliculorum* and the "Jigger" of the Southern States. Examples of the second class are the numerous species of ticks. These are found in the tropics, and are abundant in fields, woods and pastures. They leave the herbage to attach themselves to man and other animals, where they burrow into the skin and create considerable irritation. In Ontario ticks are not so abundant, but in some parts the wood tick leaves its common habitat to attack man in the way just described. The harvest mites, found in grass, hay and cereal crops, when found in large numbers also cause much irritation. The species known as *Carpoglyphus passularum* found in sugar in grocery stores often leaves the sugar to attack man, causing what is known as grocer's itch. The most common species found in houses are the Clover Mite (*Bryobia pratensis*) and the Cheese Mite (*Tyroglyphus longior*). The Clover Mites often swarm in houses in the fall of the year, where they frequently hibernate through the winter. They get into the cracks and crevices of chairs, windows, doors, etc., and cause great annoyance to the occupants of the house. The Cheese Mite is even a more serious pest, intruding itself into all the darker parts of the house. It is found in the cellar, on fruits, tubers and other food products; in the pantry on cheese, butter, flour, meat, pastry, etc.; in the wardrobe, particularly on worn and stained clothing; in the library on the paste of the book bindings; in upholstered furniture in all the niches and hollows where they can conceal themselves. Still more annoying is their habit of crawling from the clothing to the body, and in many cases, while not actually on the person, the imaginary discomfort is just as effective. The species is not parasitic. Fumigation with hydrocyanic acid has given fairly satisfactory results as a remedy for this mite.

DOMESTIC ANIMALS. Most of the injurious parasites of domestic animals, such as sheep scab, mange, ticks, follicle mites, belong to the Acarina. The sheep scab caused by the mite known as *Psoroptes communis*, var. *ovis*, is a serious disease of the sheep throughout the world. In Ontario it has occurred in Manitoulin Island and a few other parts, but by proper precautions it has either been exterminated or kept in check. They live in the skin, and obtain blood or lymph as food from the host, and in this manner give rise to considerable irritation, resulting in inflammation, scab formation, and finally in loss of wool and hair. The best treatment consists in using some external applications, such as dipping, which will kill the parasites.

The disease known as mange is caused by species belonging to two different genera, Sarcoptes and Chorioptes. The Sarcoptes when young burrow in the tissue, where they feed and develop. The species of Chorioptes do not burrow in the skin, but produce a scab similar to sheep scab, but it is restricted to certain parts of the animal, as the feet, the ears and the neck. A species of Sarcoptes causes eruptions and inflammation of the skin of horses, which becomes intensely itchy, the animal at this stage refusing food and becoming much emaciated. A species of Chorioptes is found on the horse, cattle and goat, the one attacking the horse being the most common.

Scarcely any of the domestic animals escape the attacks of the mites known as ticks. The ticks are large mites with tough, leathery skin, and possessing mouth parts fitted for sucking and legs fitted for holding on to the host. They are true external parasites and cause much annoyance by getting into the ears, around the eyes, and other places where they can avoid the efforts of the animals to dislodge them. They are most abundant in the tropics, but a few species are native to Ontario, and others again, such as the Southern cattle tick (*Boophilus bovis*), are imported to this country along with the stock.

The follicle mite of swine (*Demodex phyloides*) is the chief member of the mite class attacking swine. They live in the follicle and cause white tubercles on the skin from the size of a pin-head to that of a pea.

WILD ANIMALS.—These, of course, are not of so great economic importance, but when further studied they may be found to play a part in the transmission of disease from wild to domestic animals or man. It is astonishing to find on some animals such vast numbers of these pests. The ground hog is especially a victim to a number of species. The muskrat, the squirrel, the bat, the mole, the mouse, the moose and deer all must suffer considerable annoyance from the presence of these pests. In the study of this group several new genera were established for North America.

Only a few amphibians were examined, and on one, the Leopard frog, a species of Gamasid was found in abundance attached to the skin, apparently doing no harm, but perhaps considerably annoying its host.

Several Ontario reptiles were examined, but the writer found no indication of parasites at work. However, in the United States an interesting species of tick has been known to attack snakes.

Practically all the domestic birds suffer from the attacks of one or more species of mite. The chicken mite, *Dermanyssus gallinae,* is the commonest and most destructive pest of poultry. It is noctural and rests during the day in the crevices of roosts and nest boxes and other places of concealment. It multiplies rapidly and, unless checked by insecticides such as kerosene, will soon ruin a flock of poultry. An interesting species is found in the nasal chambers of domestic and wild birds. The injury they do has not yet been fully ascertained, but in many cases where they are very numerous they cause suffocation by choking the nasal passages. In Rhode Island a species of mite has been found in the air sacs of turkeys in every part of the State. It is again doubtful in this case as to just how much damage they cause. On the pigeon several species are found, some attacking the feathers, some the skin and others the legs and feet. These are only a few examples of the many species found on domestic fowl. It might also be mentioned here that through the agency of large shows, as the International held in Canada and the States, the tendency will be to exchange and distribute the various species of North America.

Our native birds are among the most favoured by the mite pests. In our study so far, we have found over fifty species in Ontario. Their habits vary, some living parasitically, such as Liponissus sp.; others symbiotically as in case of Analgesids; and still others merely as guests. Since many of our common birds associate and feed with our domestic birds, they may easily pass from one to the other. These again are of little economic importance so we need not discuss them further.

Fanciers of caged birds are not exempt from troubles arising from the attacks of these parasites. A species known as *Dermanyssus avium* is very common everywhere caged song birds are kept. Their habits are similar to those of the chicken mite, hiding in crevices of the roosts by day and sucking the blood from their victims at night.

AS PARASITES AND GUESTS OF INSECTS AND OTHER MITES.

A striking example of the manner in which mites assist in maintaining the balance of nature is afforded by these parasitic and predaceous creatures. It is a well known fact that many of our most injurious insect pests of fruit, garden and farm crops are controlled more effectively by the Acarids than in any other way. A notable example of this kind is found in the Locust Mite, *Trombidium locustarum.* The mite is generally found attached to the base of the second pair of wings, although it is also found on the wing itself and on any other part of the body, where it cannot be easily detached by the locust. A favourite position upon the body is between the segments of the thorax and abdomen, and also behind the upper joints of the legs, in such position their only means of attachment to their host is apparently by their mandibles. As many as a dozen or more of these mites may be found upon a single insect. These little mites render good service in checking the spread of locusts, as almost every locust upon which one is found appears to be feeble and sickly. Another species, *Celaenopsis latus,* attacks the larva of *Passalus cornutus,* and still others, attacking garden pests are found on the larva of Lachnosterna. Attacking fruit tree pests may be mentioned *Hemisarcoptes malus* on San José Scale and Oyster Shell Bark Louse; *Rhyncholophus sp.* feeding on San José and New York Plum scale; *Cheyletes pyriformis* on the larva of the Codling Moth. On forest tree insects we have a species destroying the Cottony Maple Scale and another species attacking the Maple Plant Louse. On household pests we have *Histiostoma muscarum* parasitic on the house-fly and other species on mosquitoes. The mites themselves are largely kept in check by predaceous and parasitic species belonging to this group. *Sejus macrophylus,* found in the Aspen *Eriophyes* gall, and *Gamasid* species attacking Pear Leaf Blister mite. Here we might also mention that a large number of the aquatic insects are parasitized by Hydrachnids (water mites). Besides the species found preying upon insects there are a large number which attach themselves to the body of the insect without causing any apparent harm or annoyance. Examples of these are the following:

Uropoda sp. on Rough Osmoderma, Cerambycids, Skin Beetles, Tumble Bugs, Darkling Beetles, etc.; and *Macrocheles sp.* on Carrion beetles, Silpha, and Horned Passalus.

AS PARASITES OF WATER INSECTS.

The water beetles and bugs are mostly parasitized by a species *Hydrachna belostomae* which attaches itself to the ventral surface of the Electric Light bug.

AS PARASITES AND GUESTS OF MOLLUSKS.

A number of species of water mites have been collected from the gills and attached to the bodies of bivalves but the identification of these have not yet been completed.

AS SCAVENGERS.

As a means of elimination of waste materials, there is probably no more effective agent than the mites. There is no kind of filth or decaying matter which is not relished by some species or other of the Acarids. In manure, sewerage, decaying vegetable matter, decaying animal matter and all forms of dirt, mites are to be found actively engaged.

OF MANURE. Samples of nearly all kinds of manure were used in the mite machine, and in almost every case mites were obtained. *Histiostoma valida* is a common example in horse manure.

OF DECAYING VEGETABLE MATTER. Decaying potatoes, mangels, turnips, parsnips, carrots, kohl rabi, corn stubble, cabbage, lettuce, decaying leaves, humus in the soil, sawdust, rotten stumps, fleshy fungi were all found to be hastened through the stages of decomposition by these busy creatures.

OF DECAYING ANIMAL MATTER. Almost every particle of thrown-off material from the animal body such as epidermal scales of birds and mammals, moulted skins of insects, are readily consumed by some species of these scavengers. Bone, horn, flesh and hair are also their foods, and it is next to impossible to find a single bit of any of these substances without finding along with it certain kinds of mites.

OF MINERAL MATTER. Mites were found upon rock and stone in all cases of weathering, in every little crevice where the wearings from the rock had lodged.

Again, specimens were found even in the solid rock, where, without any apparent means of sustenance, these active little creatures seemed to thrive. An example of this species is *Scutovertex petrophagus,* found at Trahanic Falls near Ithaca, N.Y.

BUSH AND FRUIT TREE PESTS.

In Canada and other countries mites that attack bush and fruit trees are among the more serious pests of the fruit growers. In Canada they are found on the apple, plum, pear, etc., and in tropical countries they are very destructive to citrous fruit trees. Examples attacking the apple tree are the Pear Leaf Blister mite, *Eriophyes pyri,* which is widely distributed throughout most of the apple growing region. They form red blister-like spots about one-fourth of an inch in diameter, which turn brown in late summer, the tissues becoming hard and corky. Three or four other species belonging to the genus Eriophyes have not such economic importance. The same species found on the apple are found attacking the pear and other trees belonging to the genus Pyrus. Another injurious species attacking the plum tree in the Niagara district is the Plum Twig Gall mite, *Eriophyes phlœocoptes.* It is an European species which has been imported into this country within recent years. The mites form small subspherical galls in clusters at the base of the buds. Pocket-like galls belonging to the genus Eriophyes are found on the leaves of the cherry, plum, and grape. Two species of red spider, *Tetranychus telarius* and *Bryobia pratensis,* are found on the under side of the leaves of the plum, pear and apple, and when in large numbers, as they usually are in dry seasons, they do a considerable amount of injury to the common fruit trees. One species confines its ravages to the secretions on the surface of the apple. The red spider is also found on the raspberry. On currant bushes in England a species known as the Black Currant Gall mite, *Eriophyes ribis,* has long been known to horticulturists in that country, and as it is spreading rapidly in England and other countries, its presence here may be expected any day. In shape this particular species is easily recognized by the distinct globular or swollen-like appearance of the buds. When the buds are badly attacked they never open into leaf, but for a time they retain their green colour, later becoming brownish, dry, gall-like bodies, more or less open at the apex. Another species of considerable economic importance in the tropics is *Eriophyes oleivorus,* the rust mite of the orange and the silver mite of the lemon. It occurs in California and lives on both leaves and fruit. On the foliage the mite causes the leaves to become curled and to lose their gloss. On the fruit of the orange the mite produces a hardening of the rind, which becomes brownish in colour. The infested orange, although injured in appearance, is better able to stand long shipment and is more juicy than the clean fruit. Upon the lemon the mites cause the rind to become silvered, the fruit is better for shipment but the rind is injured for commercial purposes.

AS PESTS OF FARM AND GARDEN CROPS.

As enemies to the growing grain and also to stacked roots such as turnips, carrots, mangels, potatoes, and even ensilage, mites are considerably destructive. Yet they are not responsible for so much damage as they are often credited with. In the field the Clover mite, *Bryobia pratensis,* is of most importance, attacking clover and other leguminous crops. Another species is found on Timothy and causes distortion of the inflorescence. In the root cellars there are hosts of species too numerous to mention, some parasitic, some saprophytic, and a few finding it a favourite place to live, but doing no harm.

AS PESTS OF VEGETABLE CROPS.

Only a few species have been found, but the enormous numbers of individuals make up for the fewness of the species. Myriads of Tetranychids are found feeding on the leaves, and the Tyroglyphids are everywhere present on the stored roots. *Tetranychus telarius* is the most common species on the outside crop, and *Tyroglyphus longior* and *Gamasids* are most troublesome inside.

AS PESTS OF SHADE TREES AND ORNAMENTAL SHRUBS AND HERBS.

Scarcely a tree or shrub escapes the attacks of one or more of these species. Some indeed, such as the maples, have as many as twenty-five or more species, feeding and absorbing nourishment from the leaves, twigs, bark, stem and roots. Most of the injuries of the trees are due to species of the Eriophyidæ, but in case of the shrubs and herbs the Tetranychids do most damage. The type of injury on the trees takes the form of galls. These are beautiful structures and at certain seasons of the year where they are not too abundant, appear more ornamental than destructive. As examples of these might be mentioned the Top Gall of the Soft Maple, the Pocket Gall of the Basswood, the Frost Gall (Erineum) of the Maple and Beech. On the shrubs we find the Tetranychus species again in evidence—the Privet, Garden Bell, Lilac, Spirea, Roses and Dogwoods. Among the ornamental herbs that suffer most from the attacks of Tetranychids are the perennial Phlox, Petunias, Nasturtium and Malva.

AS PESTS OF FOREST TREES.

The Ontario forest flora affords suitable hosts for over fifty species of gall-making mites. A few of the more important ones have been discussed under Shade Tree Pests, but a large number of the species are not met with except on forest trees. These variously shaped galls are found on the flowers, fruits, leaves, twigs, and stems of such trees as the Elms, Poplars, Willows, Oaks, Chestnuts, Hawthorns, Maples, Lindens, etc. They not only do injury to the development of the tree but cause unsightly vegetable deformities sometimes literally covering the tree. The Witches Broom of the Hackberry, Willow, etc., is also the result of the work of these mites. Much difficulty is experienced in treating the trees for these pests as they are protected by the tissue of the gall which forms around them. The lime-sulphur wash which is found most effective for the Pear-Leaf Blister mite is about the best remedy where it is practicable to spray. Red Spiders of the Tetranychus genus almost equal the Eriophyes in abundance on forest trees. Only a few species have been determined but the excessive numbers of these species which are found make up for the fewness of the species. When closer study is made of this genus, it is altogether likely that a far larger number of species will be discovered. *Tetranychus spinosa,* which is found on the Linden on the upper side of the leaves is often sufficiently abundant to consume the whole of the chlorophyll, changing the appearance of the tree from green to yellow in midsummer. *Tetranychus bicolor* produces the same effect on leaves of Oaks and Hawthorns as *T. spinosa* does to the Linden. *T. telarius* is also found on the leaves of many forest trees.

AS GREENHOUSE PESTS.

The florist is only too familiar with the work of the Red Spider and the Bulb mite, which are invariably present in large numbers attacking most of his flowering plants. Two species of Red Spider, *Tetranychus bimaculatus* and *T. telarius*, are the common species of the greenhouse of Ontario. They are found on such plants as primulas, chrysanthemums, carnations, cinerarias, tomatoes, etc. The bulb mite, *Rhizoglyphus hyacinthi*, is responsible for an enormous amount of damage in hothouses. They burrow into the healthy tissue, thereby giving a chance to the destructive soil bacteria to bring about decay. It is found on hyacinths, narcissus, orchids, and other bulbous plants. Affected bulbs should be burned as soon as the mite is discovered. *T. pallidus* is sometimes found on leaves of Chrysanthemum and *Rhizoglyphus heteromorphus*, which cause injury to the stems of carnations, are found in New York state. Other species are found on the pistil of Banana flowers in the tropical greenhouses, and on the leaves of Latania palm.

As Pests of Flour Mills, Stores, Etc.

Flour mills, grocery stores, drug stores, butcher shops, libraries, laundries, restaurants, confectioneries, seed stores, furriers and furniture stores all afford hospitality to a species or more of Acarid. The flour mites, *Aleurobius farinae* and *Tyroglyphus longior* are the chief pests of the flour mill, the grocery store, the seed store and confectionery store. The sugar mite, *Carpoglyphus passularum* is chiefly found on raw sugar.

II.—CLASSIFICATION.

The mites belong to the Phylum Arthropoda, to the class Arachnida and to the order Acarina. In a general way mites are readily identified by their one-piece or sac-like bodies, but a much greater difficulty is encountered when it comes to differentiate them from their allies, the spiders and scorpions. Scorpions have segmented bodies and spiders have a marked constriction between the cephalothorax and the abdomen, and when these characteristics are present they can be easily separated from the Acarids. They are mostly very small and some are even microscopic. It has been found that in the embryo eight legs are present, but at birth and during larval development they have only six, and after moulting a few times develop a fourth pair. Exceptions are found in the large family, Eriophyidæ—the worm-like mites—where they have but two pairs throughout life. The legs are provided with hairs and spines, sometimes much modified, fitting them for special adaptations in life. In some groups organs are found on the anterior legs which are supposed to be sensory. The last joint of the leg is commonly terminated by from one to three claws. The mouth parts take the form of a truncate cone or beak, and in some families it is partially or completely reversible. The mandibles and palpi are of various types and peculiarly modified according to the habits of the mite. In some families there is a lingula or tongue which is usually not visible except by careful examination, but in the Ixodidae it is large and roughened with sharp teeth. On the cephalothorax there are usually one or more pairs of simple eyes which are sometimes elevated on short pedicels. The reproductive organs open on the ventral surface of the abdomen, and in this respect they are like their relatives, the Arachnids.

FAMILY EUPODIDAE.

Only three species have been found in Ontario. In chopped grain, under bark of wood and under boards are the principal habitats of this family. They are predaceous, soft-bodied, small mites with very long legs, and mandibles cheylate like their relatives, the Cheyletidæ. In many respects they are primitive in that they possess characters similar to those of the spiders.

Eupodes variabilis. Found abundant on barley seed in experimental grain cellar. T. D. J., Guelph.

Eupodes sp. Found under bark of Ironwood associated with other sp. of mites. T. D. J., Guelph.

Linopodes attenuipes Bks. Found under boards on College campus. T. D. J., Guelph.

FAMILY BDELLIDÆ.

There are also three species of this family found in Ontario. Under bark of balsam, crabapple, soft maple, apple, hard maple, in mangel seed, cavities of stone and in ground spelt in Experimental grain cellar, are some of the places inhabited by this family. They are closely related to the Eupodidæ and Cheyletidæ in that they are predaceous with cheylate mouth parts and cephalothorax partially distinct from the abdomen. They are red in colour with long, slender legs and a well developed beak or rostrum.

Bdella cardinalis, Banks. Under bark of Balsam, Abies balsamæ, Crabapple, Soft Maple, Pyrus sp. In cavities in stone. T. D. J., Guelph.

Bdella tenella, Banks. Under bark of Hard Maple. In Mangel seed in the Experimental grain cellar. T. D. J., Guelph.

Bdella sp. Found in ground Spelt in Experimental grain cellar. T. D. J., Guelph.

FAMILY CHEYLETIDÆ.

This family is more or less largely represented in the Ontario fauna, containing eight species, some parasitic and predaceous upon birds, rodents, and insects. Other predaceous species may be found almost anywhere in search of mites and other insects. They are characterized by having very large palpi and are distinguished from the previous families by the absence of the demarcation between the cephalothorax and the abdomen.

Myobia caudata, Banks. Abundant on little brown bat. T. D. J., Guelph.

Myobia musculi, Derges. Found in abundance very closely attached to the hairs of the house mouse. T. D. J., Guelph.

Cheyletes pyriformis, Banks. Found on larvæ of Codling Moth in winter nest. T. D. J., Guelph.

Cheyletes longipes, Banks. Several specimens found in gelatin culture in Bacteriological laboratory., T. D. J., Guelph.

Cheyletes clavispinus, Banks. Several specimens were taken under bark of lilac. T. D. J., Guelph.

Cheyletes ferox. In hay, Ontario Agricultural College Barns. Mangel seed, Experimental office. Grain in grain cellar. Barley seed, O. A. C. barn. Ground Spelt, Experimental Department.

Cheyletielle Canadensis, Banks. Found on Bluebird, Sialia sialis. T. D. J., Guelph.

Sorergates sp. Parasite on house and field mouse in cavities or little cells just beneath the skin. J. B. T., Ottawa.

FAMILY TETRANYCHIDAE.

Five species of this family have been found in Ontario up to the present time. These are distinguished from the three preceding families by being fitted for existence entirely on vegetable matter. Trees, shrubs, and herbs are usually infested with one or more species of this family. Both sides of the leaves are attacked by mites of this family, probably the under side being their most favourite resort. Greenhouse plants as well as outdoor plants are subject to their attacks. Several species are capable of spinning a silken thread and weaving a home, and from this habit are called spinning mites. The commoner species are red in colour and from this they get the name of "red spiders." Other species are found in green, brown, and mottled colours. They all have one or two conspicuous ocelli on the cephalothorax and the body and legs usually have a few long scattered hairs.

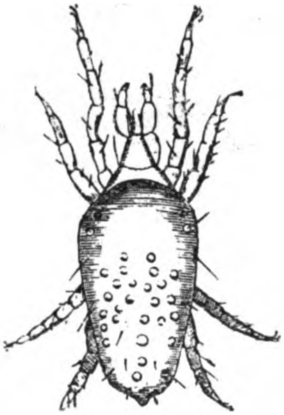

FIG. 22. Tetranychus telarius—"Red Spider."

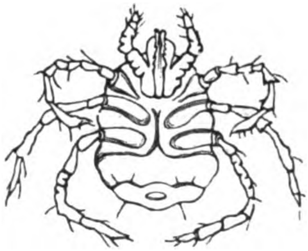

FIG. 23. Trombidium irritaus—Harvest-mite.

Tetranychus telarius, L. (Fig. 22). Found under bark of Buckthorn (Rhamnus catharticus), Crabapple (Pyrus sp.). Cultivated Alder (Alnus glutinosa). T. D. J., Guelph.

Tetranychus bicolor. Feeding on upper side of leaf of Hawthorn (Cratægus) and Burr Oak (Quercus macrocarpæ). T. D. J., Guelph.

Tetranychus spinosa. On leaves of Basswood (Tilia americana). T. D. J., Guelph.

Bryobia pratensis. In houses. On window pane of Experimental basement, Ontario Agricultural College. On clover and plum. T. D. J., Guelph.

Tetranychus bimaculatus. In greenhouse. T. D. J., Guelph.

FAMILY RHYNCHOLOPHIDÆ.

Four species occur in Ontario, all belonging to the genus Rhyncholophus. They are of much economic importance since most of our species are predaceous on scale insects. Most of our species are red in colour and possess very long legs.

Rhyncholophus pilosus. Feeding on eggs of Ichneumon; a parasite on Cecropia moth; found at base of old stump in woods; on apple tree feeding on Canker worm; on large black willow and other trees running over leaves in search of insects. T. D. J., Guelph.

Rhyncholophus parvus, Banks. Under leaves in woods. T. D. J., Guelph.

Rhyncholophus sp. Feeding on San José Scale. T. D. J., Guelph.

Rhyncholophus sp. Feeding on New York Plum scale. T. D. J., Guelph.

FAMILY TROMBIDIIDAE.

Although only three species have been studied, one of them, ***Microtrombidum locustarum,*** is of great importance, as it is parasitic upon the eggs and adults of locusts. The "Harvest mites," as they are popularly called, are recognized by the body being divided into two parts, the anterior the smaller and the posterior the larger. (Fig. 23). They are always red in colour and most of them quite large. The body is covered with a compact mass of bristles or branched hairs which gives them a velvet-like appearance.

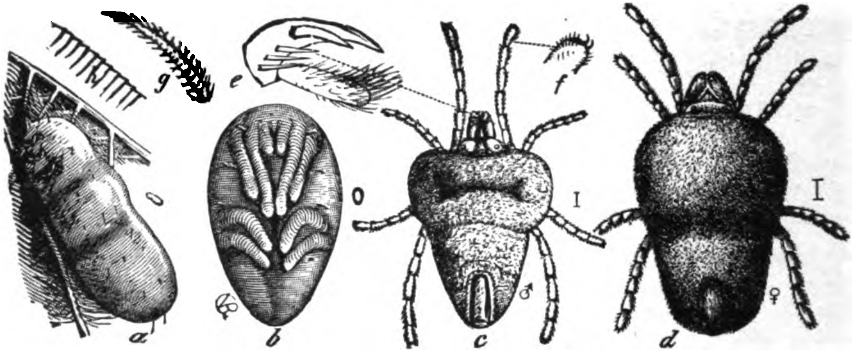

FIG. 24. Trombidium locustarum.—(*a*) mature larva, when about to leave the wing of a locust; (*b*) pupa; (*c*) male adult fresh from the pupa; (*d*) female—the natural sizes are indicated by the short lines on the right; (*e*) palpal claw and thumb; (*f*) pedal claws; (*g*) a barbed hair; (*h*) the striations on larval skin (after Riley).

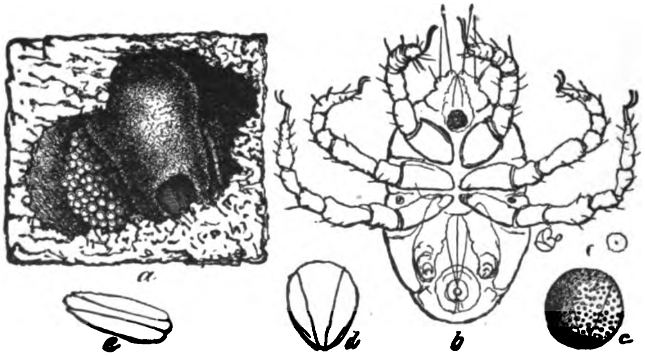

FIG. 25. Trombidium locustarum.—(*a*) female with her batch of eggs; (*b*) newly-hatched larva—natural size shown by the dot in a circle on the right; (*c*) egg; (*d, e*) empty egg-shells (after Riley).

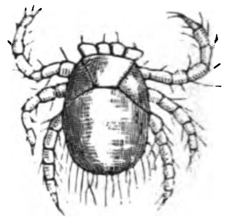

FIG. 26. Dermanysus [illegible] avium.

Trombidium sericeum, Say. On decayed log; cedar moss. T. D. J., Guelph.

Microtrombidium locustarum, Say. (Figs. 24 and 25). Parasitic on several species of locust in all parts of Ontario. T. D. J., Guelph.

Trombidium sp. On eggs of Forest Tent Caterpillar.

FAMILY HYDRACHNIDAE.

Many species belonging to this family have been obtained by means of the aquatic mite trap, but so far only two species have been identified. They are closely related to the Trombidiidæ, but are distinguished from them by means of their flattened and hairy legs and other adaptations for their aquatic existence. The young of this family are usually parasitic on water bugs and beetles, but the adults, as a rule, live free in the water.

Hydrachna belostomae, Rie. Attached to ventral surface of electric light bug. T. D. J., Guelph.

Hydrachna sp. Gills of Fresh Water Mussel. T. D. J., Guelph.

FAMILY IXODIDÆ.

Five species of this family have been found in Ontario. They are the largest of the mites and most familiar to ordinary people. The body is covered by a tough leathery skin, which in the female when filled with eggs is shown to be quite elastic by its great distension. They are usually known as ticks and are frequently parasitic upon birds, reptiles, turtles and mammals. Their chief importance is that they are transmitters of disease of man and domestic animals.

Ixodes Marxi, Banks. On Red Squirrel. T. D. J., Guelph.

Ixodes Cooki, Pack. On Groundhog. T. D. J., Guelph.

Boophilus bovis, Riley. On imported cattle. T. D. J., Guelph.

Dermacentor variabilis, Say. Dog tick. T. D. J., Guelph.

Dermacentor albipictus, Pack. Taken from moose. T. D. J., Northern Ont.

FAMILY GAMASOIDÆ.

Over thirty species are included in the Ontario fauna. Their habitat is of the most varied character of all the Acarids, some parasitic, some predaceous, some vegetarians, and some scavengers. The anatomy of this family is also very much varied. Some have a hard cariaceous integument, others again are quite soft bodied. Their legs are short and usually flat and broad.

Gamasus attenuipes, Banks. Feeding on turnip in Ontario Agricultural College root cellar. T. D. J., Guelph.

Gamasus posticatus, Banks. Under decaying maple leaves in College wood lot. T. D. J., Guelph.

Gamasus sp. Abundant in Ontario Agricultural College herbarium on pressed specimens of Pear-leaf Blister-mite. T. D. J., Guelph.

Gamasus sp. On decaying squash in Ontario Agricultural College garden. T. D. J., Guelph.

Gamasus sp. Under decaying tree in Ontario Agricultural College wood lot. T. D. J., Guelph.

Gamasus sp. Abundant on fruiting bodies of Brown Rot of Cherry (Sclerotinia fructigena). T. D. J., Grimsby, Ont.

Gamasus sp. Under decaying hard maple leaves in Ontario Agricultural College wood lot. T. D. J., Guelph.

Gamasus sp. In gall of Eriophyes on Aspen. T. D. J., Guelph.

Gamasus sp. In horse manure at Ontario Agricultural College. T. D. J., Guelph.

Gamasus sp. On sugar beet in Ontario Agricultural College root cellar. T. D. J., Guelph.

Gemasus sp. Common or Red Squirrel, Ontario Agricultural College. T. D. J., Guelph.

Gamasus sp. Under New York Plum Lecanium on Elm, Ontario Agricultural College. T. D. J., Guelph.

Gamasus sp. In Pine cone. T. D. J., Guelph.

Gamasus sp. Abundant on body of Leopard Frog. T. D. J., Guelph.

Gamasus sp. On stored celery in College cellar. T. D. J., Guelph.

Lælaps pedalis, Banks. On Chipmunk, Ontario Agricultural College. T. D. J., Guelph.

Lælaps multispinosus, Banks. Very abundant on Muskrat, Ontario Agricultural College. T. D. J., Guelph.

Liponyssus Canadensis, Banks. On English sparrow; Meadow Lark; Kingbird; Wood Pewee; White Bellied Nuthatch; Red-eyed Vireo. T. D. J., Guelph.

Lælaps longisita, Banks. Carrion beetle, Ontario Agricultural College. T. D. J., Guelph.

Lælaps propheticus, Banks. Groundhog, Ontario Agricultural College. T. D. J., Guelph.

Sejus macrophilus, Banks. Predaceous; found in gall of genus Eriophyes of Large-toothed Aspen. T. D. J., Guelph.

Dermanyssus gallinae, Redi. Abundant on domestic fowl. Guelph and all through the province. T. D. J., Guelph.

Dermanyssus avium (Fig. 26). Domesticated caged birds. T. D. J., Guelph.

Cœlænopsis latus. Attached to beetle (Passalus cornutus). T. D. J., Guelph.

Liponyssus sp. On Star-nosed Mole. T. D. J., Guelph.

Caelaenopsis pedalis, Banks. Attached to larvæ of Spotted Pelidnota. T. D. J., Guelph.

Uropoda sp. On mangel seed in Experimental basement. T. D. J., Guelph.

Uropoda sp. On leaves of Rananculus acris. T. D. J., Guelph.

Uropoda sp. On Rough Osmoderma; Long-horned Borer; Skin Beetle; Horned passalus; Tumble Bug; Tenebrio. T. D. J., Guelph.

Macrocheles sp. On Horned passalus; Carrion beetle; Large Silpha. T. D. J., Guelph.

Lælaps sp. On Mangel in Ontario Agricultural College root cellar. T. D. J., Guelph.

Liponyssus sp. Attacking dipterous larva feeding on samara of Silver Maple. T. D. J., Ontario Agricultural College, Guelph.

Lælaps sp. On White-bellied Nuthatch. T. D. J., O.A.C., Guelph.

Dermanyssus sp. Abundant on Screech Owl. T. D. J., Guelph.

FAMILY ORIBATIDÆ.

This family is also well represented in our fauna, containing about twenty-four species. They are often called Beetle mites on account of their horny-like integument which in appearance is like the elytra of the Coleoptera. The food of the Oribatidæ is mostly of a vegetable nature, but some species are found on decaying matter and others again on the eggs of scale insects. Their habitat varies very considerably. Some are found under the bark of trees, others on stacked roots, in cavities of stones, on gall tissue, under boards, on decaying leaves, in moss and various other places. They can easily be recognized by a bristle arising from a small indentation on the posterior corners of the cephalothorax, and abdomen is well marked. The mouth parts are obscure and the palpi very small. An interesting thing about this family is the manner in which some of the nymphs collect and carry moulted skins, dirt, moss, etc., on their backs. The shapes and appendages of this family are strikingly peculiar in many species.

Galumna emarginata, Banks. In cavities in stone. T. D. J., Guelph.

Galumna moesta, Banks. Cavities in stone. On mangels in root cellar, O.A.C. Turnip in root cellar, O.A.C. T. D. J., Guelph.

Nothrus excisus Banks. Under bark of Austria Pine and Norway Spruce T. D. J., O.A.C., Guelph.

Oribatella pallida, Banks. Under bark of Hard Maple, Norway Spruce, Apple, Crab Apple. T. D. J., Guelph.

Hoploderma granulata, Banks. Harrington, Ottawa.

Oribatella formosa, Banks. Under bark of Catalpa, Norway Spruce, Lombardy Poplar, Mountain Ash. T. D. J., Guelph.

Eremaeus pilosus, Banks. Under bark of Catalpa, Buckthorn, Balsam, Cut-leaved Alder, Austria Pine, Mountain Ash. T. D. J., Guelph.

Galumna affinis, Banks. Under board on College campus. T. D. J., Guelph.

Galumna depressa, Banks. On turnip and mangel, in O.A.C. root cellar. T. D. J., Guelph.

Oribata depressa, Banks. On mangel in O.A.C. root cellar. T. D. J., Guelph.

Galumna hirsuta, Banks. Under bark of walnut. T. D. J., Guelph.

Galumna sp. Under Lecanium scale. T. D. J., Guelph.

Oribata sp. In cavities in stone. T. D. J., Guelph.

Nothrus sp. Under bark of Soft Maple. T. D. J., Guelph.

Oribata sp. On large fungus gall of grape. T. D. J., Niagara Falls.

Pelops terminalis. Under bark of Ironwood. T. D. J., Guelph.

Notaspis Burrowski, Nuch. Western Ontario. T. D. J.

Notaspis Canadensis, Banks. W. H. Harrington, Ottawa.

Galumna sylvicola. Among fallen leaves in the forest. T. D. J., Guelph.

Liacarus panulus. From moss on a stump. T. D. J., Guelph.

Oribata Canadensis. Under bark of Ironwood. T. D. J., Guelph.

Oribata perolota. In corn stubble. T. D. J., Guelph.

Oribata neosota. From decayed leaves. T. D. J., Guelph.

Cymberemaeus parvula. Under bark of Ironwood. T. D. J., Guelph.

FAMILY TYROGLYPHIDÆ.

We have found ten species in our fauna. They are great destroyers of property, for, although very minute in size, their enormous numbers make up for their minuteness. The list of species tabulated below will give some idea of the varied habits and habitat of this family. The hypopol stage is a resting one, and at this period in their life history they often attach themselves to other animals, but as the mites do no feeding at this time they cannot be called true parasites. In this stage their chief object is to migrate to new feeding grounds. They are usually pale coloured or slightly tinted with pink, with soft bodies and prominent cheylate mandibles. There are no eyes and no special breathing organs.

Tyroglyphus longior, Germans. In all parts of houses. On cheese in cheese factories, barley seed, whole wheat, turnip and mangel in O.A.C. root cellar; bulb of Gladiolus; under Oyster-shell scale. T. D. J., Guelph.

Tyroglyphus siro, Linnaeus. (Fig. 27.) On cheese in cheese factories in various parts of the Province. Smoked hams. T. D. J.

Tyroglyphus Americanus, Banks. In test tube of Bacteriological laboratory. In jar of raspberry jam. T. D. J., Guelph.

Rhizoglyphus hyacinthi, Bos. Bulb of Gladiolus, common Daffodil. T. D. J., Guelph.

Rhizoglyphus rhizoglyphus, Banks. On hay, O.A.C. barn; decaying potatoes and parsnips, decaying heart of celery. T. D. J., Guelph.

Rhizoglyphus phylloxeræ, Riley. (Fig. 28.) On turnip in root cellar, Guelph; on decaying heart of celery, Guelph; on roots of grape, London. T. D. J., Guelph.

Carpoglyphus passularum, Hr. On raw sugar from store in Guelph; on smoked ham in pork packing house. T. D. J., Guelph.

Histiostoma muscarum. Attached to housefly. T. D. J., Guelph.

Histiostoma valida, Banks. In horse manure, Guelph. T. D. J., Guelph.

Aleurobius farinae. Fairly common in flour in flour mills. T. D. J., Guelph.

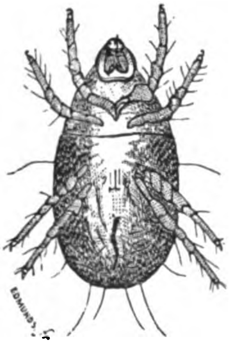

FIG. 27. Tyroglyphus siro—Cheese mite.

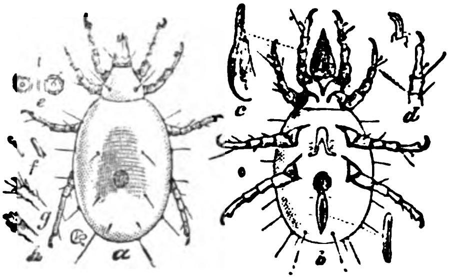

FIG. 28. Rhizoglyphus phylloxeræ.

FAMILY CANESTRINIDÆ.

Only one species so far found in Ontario. It, however, is of much economic importance, as it is predaceous upon the San José Scale. They are small, short-legged mites, closely related to the Sarcoptidæ and also apparently to the Tyroglyphidæ.

Hemisarcoptes malus, Sch. San José Scale, St. Catharines. T. D. J.

FAMILY ANALGESIDÆ.

Forty-three species have been taken in this Province. They inhabit the feathers of birds and apparently do little or no injury to the host. They are extremely small and found in great abundance on the feathers of the wings and other parts of the bird. W. R. Thompson, B.S.A., of the Gypsy Moth Laboratory of Boston, has made a special study of the anatomy and characteristics of this family in Ontario, using the collection of the writer. In this connection I wish to emphasize the patient and painstaking work of Mr. Thompson on this family, while a pupil of the Zoological Department of this College. A full list of these species will be published in the annual report of this Society for 1910.

FAMILY LISTROPHORIDAE.

These are closely related to the bird mites and live upon mammals. Our species was found on the muskrat. They also are small, soft-bodied mites, with short legs terminating in a sucker. Similar to the bird mites they feed upon the hairs of the small mammals.

Listrophorus validus, Banks. Taken from muskrat. T. D. J., Guelph.

FAMILY SARCOPTIDAE.

These are the itch mites of man and domestic animals, birds, etc. They, in some cases, burrow within the skin and thereby produce intense itching, and in many cases a diseased condition of the host, commonly known as scabies or mange. The mites are very small, white and semi-globular in shape. Several species of this family have been found in Ontario.

Sarcoptes scabies, Itch mite. (Figs. 29 and 30.) Host, horses. Ontario, T. D. J., Guelph.

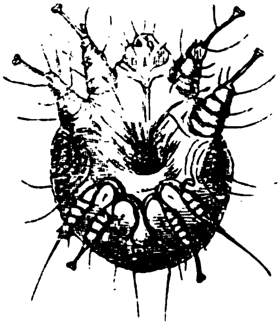

FIG. 29. Male Itch Mite.

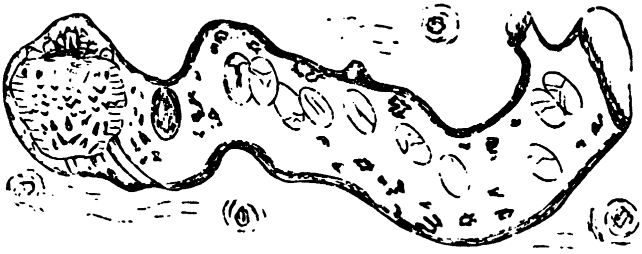

FIG. 30. Tunnel of Female Itch Mite beneath the skin—adult at left end, eggs throughout the tunnel.

Chorioptes symbiotes, var. equi, Verheyen. On legs of horses. T. D. J., Guelph.

Chorioptes symbiotes, var. *bovis.* On cattle. T. D. J., Guelph.

Psoroptes communis, Furst. On sheep. Manitoulin Island. T. D. J.

FAMILY ERIOPHYIDAE.

This is a family of microscopic mites, which are quite curious and unusual in structure. They have only two pairs of legs and the abdomen is long and striated. These striations, which differ in the different species and differ in number on the dorsal and ventral surfaces, are of considerable importance in the classification. The galls produced vary in form, but are always open or provided with an opening through which the mites pass in and out. They are generally lined with minute hairs (trichomes), which may be simple or branched. The different types of Eriophyid galls are shown in figures 31 to 39. Sixty-six species occur in Ontario.

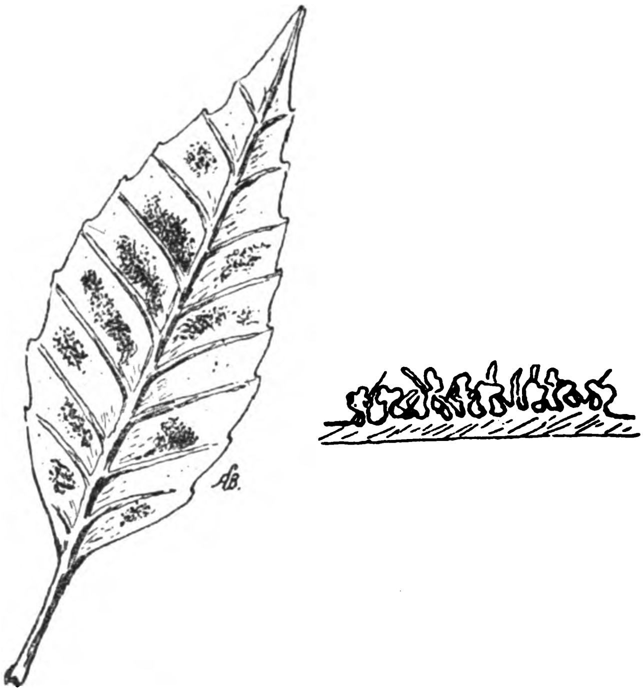

Fig. 31. Erineum on leaf of beech; natural size and highly magnified.

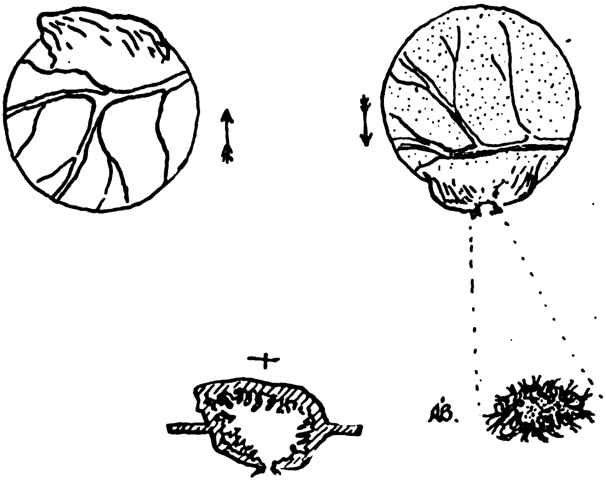

Fig. 32. Capsule Gall: Upper and lower surfaces; interior and opening of capsule, highly magnified.

HOST—ALDER.

Eriophyes sp. A white, frost-like erineum on under side of leaf in the axils of the veins. Trichomes dense, pellucid. (Fig. 31.) Alnus incana. T. D. J., Guelph.

Eriophyes sp. A small, red or green pubescent pocket gall on leaf. Alder Pocket Gall. (Fig. 34.) Alnus incana. T. D. J., Guelph.

HOST—ASH.

Eriophyes fraxini (Garman). Small, irregular, smooth, more or less spherical capsule gall, protruding on both sides of the leaf. Ash Mite Gall. (Fig. 32.) Fraxinus americana. T. D. J., Guelph.

Eriophyes sp. Pinkish-white, elongated capsule galls on the veins of the leaf. Ventrally the galls appear as white, hairy projections following the veins. Ash Vein Gall. T. D. J., Guelph.

Eriophyes sp. A deformation of the terminal buds, their development arrested, producing a mass of small twisted leaf ends. Fraxinus americana. (Fig. 37.) T. D. J., Guelph.

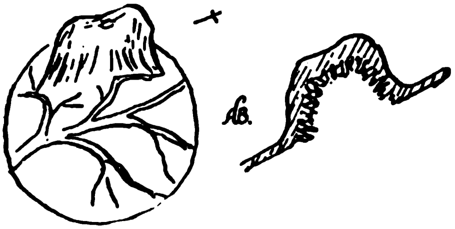

FIG. 33. Dimple Gall and section of interior greatly magnified.

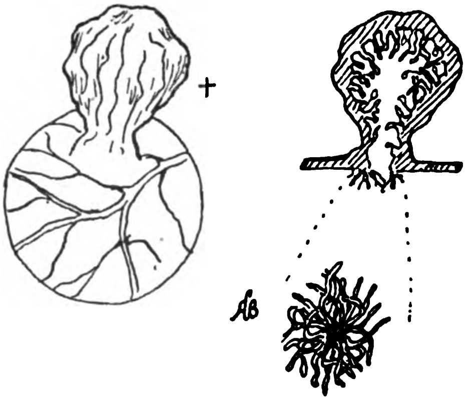

FIG. 34. Pocket Gall: Upper surface of leaf; interior of gall, much magnified.

Eriophyes sp. Leaves dwarfed and distorted in a bundle. Resembles somewhat Cecidomyia solidaginis. Ash Bunch Gall. Fraxinus americana. T. D. J., Guelph.

Eriophyes sp. Small, irregular, more or less spherical capsule gall, protruding on both sides of leaf. Galls hairy. Fraxinus pubescens. T. D. J., Guelph.

HOST—BASSWOOD.

Eriophyes abnormis, Garman. Balloon-shaped galls on the upper surface of the leaf. Apex of gall usually serrated. Basswood Balloon Gall. Tilia americana. T. D. J., Guelph.

Eriophyes sp. Irregular, circular, dark reddish-brown spots 4-5 mm. in diameter, having in their centre very characteristic tufts of whitish hairs. Basswood Tufted Gall. Tilia americana. T. D. J., Guelph.

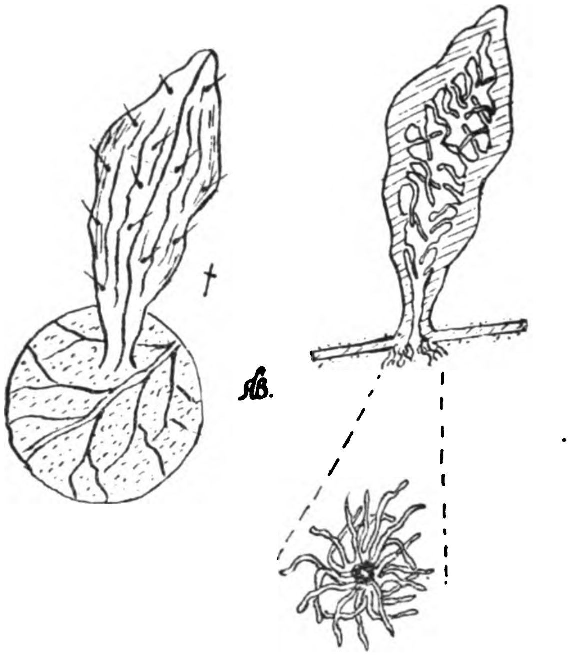

FIG. 35. Pouch Gall on upper surface of leaf; interior of gall, much magnified.

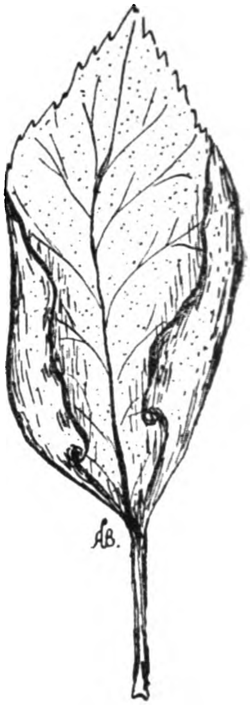

FIG. 36. Leaf-margin Gall.

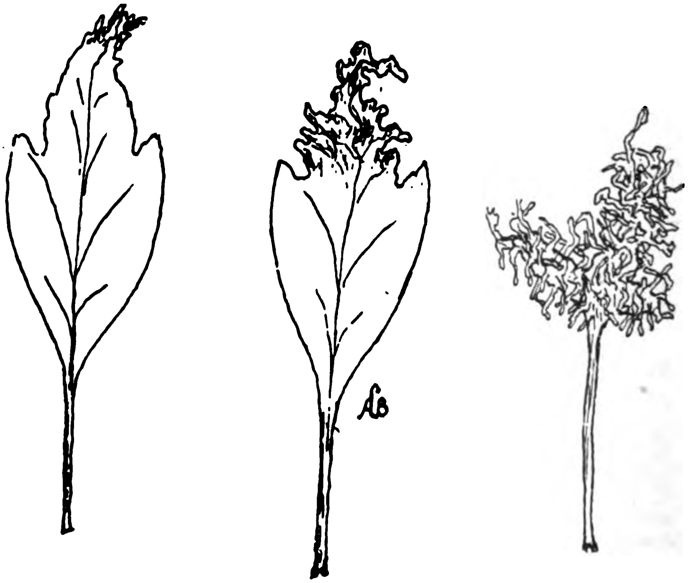

FIG. 37. Leaf-distortion Gall, different stages.

Eriophyes sp. A white erineum or shallow dimple on underside of leaf, much like the Erineum on Acer negundo. Tilia europea. T. D. J., Guelph.

HOST—BEECH.

Eriophyes sp. A frosty, white erineum in large patches on the under side of the leaf. Trichomes spherically capitate. Fagus americanus. T. D. J., Guelph.

HOST—BIRCH.

Eriophyes sp. A bud deformation, crowded and irregular, often in bunches of large size. Birch Bud Gall. (Fig. 38.) Betula lutea. T. D. J., Guelph.

Eriophyes sp. A rosy-pink erineum in large patches on the upper side of the leaf. Betula lenta. T. D. J., Guelph.

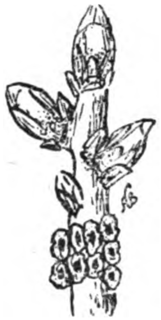

FIG. 38. Bud-like Galls.

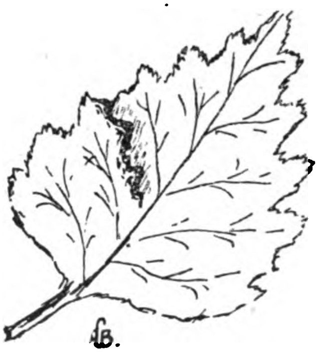

FIG. 39. Serpentine Gall.

Eriophyes sp. A yellowish-white to brownish erineum forming large patches between the ribs on the under side of the leaf. Betula papyrifera. T. D. J., Guelph.

Eriophyes sp. A transparently white, granular erineum on the surface of the leaves. Betula pumila. T. D. J., Guelph.

Eriophyes sp. A capsule gall, very small, yellow to brown. Paper Birch Capsule Gall. (Fig. 32.) Betula papyrifera. T. D. J., Guelph.

Eriophyes sp. A nodular pocket gall, occurring upon both faces of the leaf; yellowish, or reddish to purplish. Paper Birch Pocket Gall. Betula papyrifera. (Fig. 34.) T. D. J., Guelph.

HOST—BUTTONBUSH.

Eriophyes cephalanthe (Cook). Clusters of small dimples on the upper side of the leaf, 1 to 3 mm. high. Buttonwood Dimple Gall. Cephalanthus occidentalis. T. D. J., Guelph.

HOST—CHESTNUT.

Eriophyes sp. A small, capsule gall on the leaf, more or less spherical and 2-3 mm. in diameter. Chestnut Capsule Gall. Castanea sativa, var. americana. T. D. J., Guelph.

HOST—ELM.

Eriophyes ulmi (Garman). Small green to yellowish pocket-galls, more or less spherical, usually on the upper side of the leaves. Elm Pocket Gall. (Fig. 34.) Ulmus americana and U. racemosa. T. D. J., Guelph.

Eriophyes sp. An erineum on the under side of the leaf; white at first, changing to brown. Trichomes simple, tangled. Rock Elm Erineum Gall. Ulmus racemosa. T. D. J., Guelph.

Eriophyes sp. A very large pouch-gall on the leaves, commencing as a cone or deep dimple. (Fig. 35.) Ulmus pubescens. T. D. J., Guelph.

HOST—GRAPE.

Eriophyes sp. A white erineum on the underside of the leaf. Trichomes simple. Wild Grape. T. D. J., Guelph.

Eriophyes sp. Small, semi-circular or nearly circular capsules along the veins, about 2 mm. in diameter, and but slightly elevated on either surface. On upper surface paler than the leaf; below, with a white nipple surrounded by a furrow. Vitis cordifolia. T. D. J., Guelph.

HOST—HAWTHORN.

Acarus crataegi vermiculus. A fold of the leaf making long, irregular, wavy projections on the upper surface of the leaf. From the midrib to the edge of the leaf in the general direction of the gall. Serpentine Gall. Cratægus sp. T. D. J., Guelph.

Eriophyes sp. Small, round swellings (capsules) protruding very slightly on both sides of the leaf. About .5-1 mm. in diameter. Galls very numerous where they occur—sometimes more than 100 on a single leaf. Speck Gall. Cratægus sp. T. D. J., Guelph.

Eriophyes sp. Very small, monothalmous, conical structures, 1 to 2 mm. high and 1-1.5 mm. wide at the base; formed anywhere on either surface of the leaf and sometimes on the stem of young twigs. Cone Gall. Cratægus sp. T. D. J., Guelph.

HOST—HAZEL.

Eriophyes sp. This gall is found only along the main veins of the leaf. The part of the leaf around the affected portion of the vein becomes crimped, the crimps all radiating towards the vein as a common centre. Hazel Leaf Crimp Gall. Corylus americana. T. D. J., Guelph.

Eriophyes avellanae. A bud deformation, which attacks bud as soon as it expands, and checks its subsequent development. Hazelnut Bud Gall. Corylus americana. T. D. J., Guelph.

HOST—GENUS JUGLANS.

Eriophyes sp. A brown, velvety erineum surrounding the leaf stalks, or on the main veins, causing a swelling or bending of the stalk or vein. Walnut Cushion Gall. Juglans nigra and probably J. cinerea. T. D. J., Guelph.

Eriophyes sp. A green pocket-gall on the upper side (usually) of the leaf. Walnut "Wart" Gall. Juglans nigra and probably J. cinerea. T. D. J., Guelph.

HOST—JUNEBERRY.

Eriophyes sp. Small, nearly globular, dark brown, pocket galls, averaging 2 mm. in diameter, singly or in clusters on the upper side of the leaf. Juneberry Ball Gall. Amelanchier rotundifolia. T. D. J., Guelph.

HOST—MAPLE.

Eriophyes sp. A whitish frost-like erineum with scattered spots of rosy-pink, on the upper surface of the leaf, sometimes nearly covering it. Acer rubrum. T. D. J., Guelph.

Eriophyes sp. A pale yellow or white erineum on the under side of the leaf. Trichomes capitate. Acer saccharinum. T. D. J., Guelph.

Phlœcoptes quadripes. A nearly spherical pocket gall on the upper surface of the leaf, varying from light green through red or purple to black. Acer saccharinum. T. D. J., Guelph.

Eriophyes sp. A white or whitish erineum in patches on the under side of the leaf, often limited by the veins. Trichomes capitate. When old, the trichomes assume a brown colour. Acer saccharum. T. D. J., Guelph.

Phlœcoptes aceris. A green, reddish or purplish, slender, pouch-gall projecting from the upper surface of the leaf. Acer saccharum. T. D. J., Guelph.

Eriophyes sp. A white or whitish erineum on the under side of the leaf. Acer nigrum. T. D. J., Guelph.

Eriophyes sp. Irregular wart-like swellings (Dimple) on the upper surface of the leaf. The swellings are green at first and turn gray when mature. The average diameter is about 3 mm. Manitoba Maple Wart Gall. Acer negundo. T. D. J., Guelph.

Eriophyes sp. A white, whitish, or pale yellow erineum on the under side of the leaf, in patches often in the axils of the veins. Trichomes long, tangled and distorted. Acer spicatum. T. D. J., Guelph.

HOST—OAK.

Eriophyes querci. An irregular dimple upon the blade of the leaf. From beneath it appears as an irregular cavity, lined with a tangled mass of white vegetable hairs. Oak Dimple Gall. Quercus macrocarpa. T. D. J., Guelph.

Eriophyes sp. A dense mat of brown hairs growing in large patches upon the under side of the leaves. Oak Hair Gall. Quercus sp. T. D. J., Guelph.

HOST—POPLAR.

Eriophyes sp. Circular, flat or slightly convex, frost-like patches varying from 2-3 mm. in diameter, on the upper side of the leaf. Large-toothed Aspen Frost Gall. Populus grandidentata. T. D. J., Guelph.

Eriophyes sp. Circular depressions dimple always on the lower side of the leaf. On the upper side it appears as a reddish circular elevation. Large-toothed Aspen Convex Gall. Populus grandidentata. T. D. J., Guelph.

Eriophyes sp. Dimple-like galls on the upper side of the leaf of the Aspen. Aspen Dimple Gall. Populus tremuloides. T. D. J., Guelph.

Eriophyes sp. Irregular tubercular masses of closely-packed small reddish-green protuberances on the stem. Unsightly Poplar Gall. Populus tremuloides.

Eriophyes sp. A depression on the lower surface of the leaf, 4-12 mm. in diameter and 2-5 mm. in depth. Under surface of gall is orange-yellow. Populus italica. T. D. J., Guelph.

Eriophyes sp. Margin of leaf distorted and curled. Populus tremuloides. T. D. J., Guelph.

HOST—GENUS PRUNUS.

Eriophyes sp. Reddish, slender pouch-galls, somewhat irregular and pubescent, ¾ mm. long and .5-1 mm. in diameter. Pin Cherry Pouch Gall. Prunus pennsylvanica. T. D. J., Guelph.

Eriophyes sp. Green on rosy-red pouch-gall on the upper side of the leaf .5-6 cm. in length. The gall is constricted about half way to the leaf. Black Cherry Pouch Gall. Prunus serrotina. T. D. J., Guelph.

Eriophyes sp. Green or reddish pouch gall on the upper side of the leaf, differing from the Black Cherry Pouch Gall in that the aperture is not funnel-shaped. Choke Cherry Pouch Gall. Prunus virginiana. T. D. J., Guelph.

Eriophyes sp. A very long, slender, pouch-gall, green or whitish on either side of the leaf. Wild Plum Pouch Gall. Prunus americana. T. D. J., Guelph.

Eriophyes phlœocoptes. A tubular growth, encircling base of buds and shoots. Plum Bud Gall. Prunus domestica. T. D. J., Guelph.

HOST—GENUS PYRUS.

Apple, Crab Apple. Pear and Chokecherry.

Eriophyes sp. Dimple galls, with the concavity on the upper surface of the leaf. Internal surface corrugated. Apple Dimple Gall. Pyrus malus. T. D. J., Guelph.

Eriophyes pyri. Capsule Galls on the upper side of the leaf. Apple and Pear "Leaf-blister" Gall. Pyrus malus, P. coronaria and P. communis. T. D. J., Guelph.

Eriophyes sp. Capsule Galls, very small. When mature, brown in color. Chokecherry Speck Gall. Pyrus arbutifolia. T. D. J., Guelph.

HOST—SUMAC.

Eriophyes sp. The leaf margin rolled tightly upward and inward on both sides. Sumac Leaf-margin Gall. Rhus typhina. T. D. J., Guelph.

Eriophyes sp. Irregular, rounded, dimple gall, convex on the upper or under side of the leaf. Green to red or purple in color; inside clothed with white trichomes. Poison Ivy Dimple Gall. Rhus radicans. T. D. J., Guelph.

HOST—WILLOW.

Eriophyes sp. A pale green or purple capsule gall, projecting either above or below the leaf, or both; 1½ to 2 mm. in diameter. Salix cordata. T. D. J., Guelph.

Eriophyes sp. Small, irregular, serrate and roughened pocket-galls or semi-capsules, green or red, strongly pilose above and thickly pubescent beneath. Usually on the upper side of the leaf. Salix discolor. T. D. J., Guelph.

Eriophyes sp. Small, crimson pocket-galls or semi-capsules on the upper side of the leaf. 1½ to 2½ mm. in diameter. Salix amygdaloides. T. D. J., Guelph.

Eriophyes sp. A small capsule gall, irregularly hemispherical, greenish yellow, with a projecting aperture usually on the lower surface of the leaf, 1 to 2½ mm. in diameter. Salix nigra. T. D. J., Guelph.

Eriophyes sp. Small, irregular, serrate capsule gall, green or red, usually on the upper side of the leaf; beneath sometimes impressed, more often projecting. 1 to 2 mm. in diameter. Salix bebbiana. T. D. J., Guelph

Eriophyes sp. Small, irregular, serrate capsule gall, projecting on both sides of the leaf, 1 to 2 mm. in diameter. Salix petiolaris. T. D. J., Guelph.

Eriophyes sp. A bud deformation of the flower catkins and leaf buds or parts of leaves, producing a large, irregular, crumpled mass. Salix nigra. T. D. J., Guelph.

Eriophyes sp. Rosette-like structures on the leaves and stems. Unsightly Willow Gall. Salix sp. T. D. J., Guelph.

FAMILY DEMODECIDÆ.

This again is a small family, only two species being found in the Province, one parasitic upon man and the other on swine. They are small and worm-like and resemble the gall mites.

Demodex folliculorum, Simon. Parasitic on man. T. D. J., Guelph.
Demodex phylloides, Croker. On hog. T. D. J., Guelph.

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SAUNDERS, WILLIAM. Destroying eggs of Clisiocampa sylvatica and C. Americana on Nursery Stock in Ontario. Ninth Annual Report of the Entomological Society of Ontario.

THE ENTOMOLOGICAL RECORD, 1909.

BY ARTHUR GIBSON, OTTAWA.

The weather conditions of 1909, on the whole, in Canada, were particularly well suited for the growth of vegetation of all kinds. In eastern Ontario, comparatively speaking, there were few really hot days, and these not until about the middle of August. Injurious insects were not complained of to such an extent as they were in 1908. Many collectors have commented on the scarcity of insects, even of many of the commoner forms. As is always the case, however, desirable species have been collected by those who have worked assiduously throughout the season. In Manitoba, Mr. Norman Criddle reported that the season was a most peculiar one, the evenings being particularly bright, for which reason it was almost impossible to attract any moths to lights. In the early part of the season, too, there was an exceptional outbreak of plant lice of all kinds, and it was noticed that night-flying moths frequented trees, mostly Manitoba maples and oaks, which were infested by the aphides, to feed upon their honey dew. The past season was certainly a most remarkable one for plant lice all over Canada.

During 1909 a good deal of material, collected in previous years, has been worked up by specialists, and notes on some of these are included in this year's Record. Unfortunately, a number of our Canadian collectors have not been as active in 1909 as they were in other years. Undoubtedly the great loss sustained by entomologists generally throughout Canada in the death of Dr. James Fletcher, has had some effect on systematic work. We should, however, now even strive all the more to continue the work he so ardently encouraged.

Since the appearance of the Entomological Record for 1908, the writer has received letters from many collectors, all of whom expressed the hope that the Record would be continued from year to year. He begs to thank his correspondents for their continued interest and help.

During 1909 few important expeditions have been made in Canada, as far as the writer knows, for the purpose of collecting and studying insects. Mr. J. B. Wallis, of Winnipeg, Man., spent most of the summer in the Okanagan Valley of British Columbia, and while there collected several thousand specimens which will be gradually worked up. Mr. C. H. Young, of the Geological Survey, Ottawa, while at Ucluelet, B.C., from May to August, collected a good many insects of interest. His work there, however, with Prof. John Macoun, of the same institution, was chiefly connected with the collection and preservation of star fish, crabs and other salt water objects. Mr. Geo. A. Moore, of Montreal, collected hemiptera almost exclusively at North Hatley, Que., in July, and secured much interesting material. The writer spent the whole of August in New Brunswick and Prince Edward Island and brought back collections in all orders.

In 1907 Messrs. Ernest Thompson Seton and E. A. Preble brought back with them from the Great Slave region a small collection of lepidoptera, among which were some interesting species. Mr. Wm. Beutenmuller, of the American Museum of Natural History, New York, has very kindly sent me a list of the species, and mention is made of several of them in this Record.

As in previous years, Canadian students have again to acknowledge the great help which they have received during the year from specialists in the United States and elsewhere. Those who have specially helped, in 1909, are: Dr. L. O. Howard, with his assistants, at Washington, D.C.; Dr. J. B. Smith, of New Brunswick, N.J.; Sir George Hampson, of the British Museum; Prof. H. F.

Wickham, of Iowa City, Iowa; Mr. W. D. Kearfott, of Montclair, N.J.; Mr. E. P. Van Duzee, of Buffalo, N.Y.; Mr. Wm. Beutenmuller, of New York, N.Y.; Dr. Henry Skinner, of Philadelphia, Pa.; Dr. E. M. Walker, of Toronto, Ont.; Col. Thos. L. Casey, of Washington, D.C.; Mr. Charles Leibeck, of Philadelphia, Pa., and Rev. G. W. Taylor, of Departure Bay, B.C.

LITERATURE.

Among the publications which have been received during the year, and which are of interest to Canadian students, mention may be made of the following:—

BACK, ERNEST A. The Robber-flies of America, North of Mexico, belonging to the subfamilies, Leptogastrinæ and Dasypogoninæ. Trans. Amer. Ent. Soc., Numbers 2 and 3, April-September, 1909, pp. 137-400. In this splendid paper 194 species, and 36 genera are described; 20 species and 1 genus are new. Eleven plates, illustrating a number of the species, appear at the end of the paper. Only 12 species are recorded from Canada. Many others have doubtless been taken in the Dominion, but these were not available for study by the author. The paper is a welcome one and will be of much value to dipterists.

BANKS, NATHAN. Directions for Collecting and Preserving Insects. Washington; Smithsonian Institution, Bulletin No. 67. This valuable bulletin was received on Oct. 14, 1909. It takes the place of the work prepared in 1892, under the direction of the late Dr. C. V. Riley. Many new features occur in this bulletin, and a large number of notes are included which have been furnished by specialists in the different Orders. 188 figures in the text appear, as against 139 in Riley's publication. The Bulletin will be most useful as a means of reference.

BEUTENMULLER, WILLIAM. The Species of Holcaspis and their Galls (issued 17th Feb., 1909); The Species of Amphibolips and their Galls, (issued March 9, 1909); The North American Species of Diastrophus and their Galls, (issued March 19, 1909): American Museum of Natural History, New York. These papers on gall insects are most useful. The illustrations accompanying each are beautifully drawn, and with the descriptions of the galls and the makers, afford an easy means of identification. We hope to see more of these articles by this well-known author. Many of the species included in the above papers occur in Canada.

BLAISDELL, FRANK E., SR. A Monographic Revision of the Coleoptera belonging to the Tenebrionid Tribe Eleodiini, inhabiting the United States, Lower California and adjacent Islands. United States National Museum, Bulletin 63, Washington, issued June 24, 1909. This important monograph of 524 pp. and 13 plates, represents an enormous amount of work for which coleopterists generally will be very grateful. 124 species and varieties are treated of, each at considerable length. It is to be hoped that this bulletin will be freely used by Canadian coleopterists, so that we may soon know more about the beetles of this tribe occurring in the Dominion.

HAMPSON, SIR GEORGE F. (*Bart*). Catalogue of the Lepidoptera Phalænæ in the British Museum; Vol. VII., pp. 709, plates cviii. to cxxii., received Feb. 8th, 1909; Vol. VIII., pp. 583, plates cxxiii. to cxxxvi., received Sept. 1st, 1909. These two volumes which appeared during the year are of great interest to students of the lepidoptera. Vol. VII. is the first part of "the classification of the very large sub-family *Acronyctinæ*, which comprises some 3,000 species belonging to over 300 genera. .... The sub-family is characterised by the trifid neuration of the hind wing combined with spineless tibiæ and smooth eyes not surrounded by bristle-like hair, and it is the least specialised of the subfamilies of the *Noctuidæ Trifinæ.*" Vol. VIII. is the second part of the *Acronyctinæ;* 104 genera are treated of, comprising 720 species. In Vol. VII., 843 species belonging to 96 genera are dealt with. The third and final part of the subfamily is prepared and it is expected will be issued very soon. The beautiful coloured plates which accompany each volume of the Catalogue, are of immense service to students. Those which refer to Vols. VII. and VIII., are of the same degree of excellence. Many of the species figured occur in Canada, and are at once recognized. We are glad to see the names of several Canadian collectors in the text, all of whom have sent material for the collection of the British Museum. Sir George Hampson is very grateful for noctuids from Canada, and all who can should assist him as far as possible in his valuable work.

HOPKINS, A. D. The Genus Dendroctonus. (Contributions toward a monograph of the Scolytid beetles). United States Department of Agriculture, Bureau of Entomology; Technical Series No. 17, Part 1, issued June 30, 1909. The results of Dr. Hopkins' studies in this important genus will be of much use to coleopterists generally, and of particular interest to the economic entomologist. This first part of the bulletin is one of the best of the many valuable publications of the U. S. Bureau of Entomology. In the introductory chapter it is stated that, "It is the purpose of this paper to revise and bring up to date the available information on the described species, to describe those that appear to be new to science, and to record the results of original investigations relating to the more technical details that can not well be included in the paper which is to follow as a part of a bulletin in the regular series and which will give full information on the bionomic features." Twenty-four species are treated of, seven of which are new to science.

SMITH, JOHN B. Our Insect Friends and Enemies—The Relation of Insects to man, to other animals, to one another, and to plants, with a chapter on the War Against Insects. Philadelphia and London, J. B. Lippincott Company, 1909. This splendid work of 314 pp., by the above recognized authority, is a very welcome addition to the literature of Entomology. Dr. Smith has divided the book into 12 chapters, viz.: (I) Insects in their Relation to the Animal Kingdom; (II.) Insects in their Relation to Plants as Benefactors; (III.) Insects in their Relation to Plants as Destroyers; (IV.) Insects in their Relation to each other; (V.) Insects in Relation to the Animals that feed on them; (VI.) Insects in their Relation to Weather and Diseases that affect them; (VII.) Insects in their Relation to other Animals; (VIII.) Insects in their Relation to Man as Benefactors; (IX.) Insects in their Relation to Man as Carriers of Diseases; (X.) Insects in their Relation to the Household; (XI.) Insects in their Relation to the Farmer and Fruit Grower; (XII.) The War on Insects.

The book is full of information and will doubtless have a very wide sale. It is illustrated by many figures in the text, and at the beginning there is a full-paged coloured plate of some of the commoner insects which are troublesome in houses. The work is well printed, and we congratulate the author on this latest of his many publications.

SNODGRASS, R. E. The Thorax of Insects and the Articulation of the Wings: Proc. U. S. Nat. Museum, Vol. XXXVI., pp. 511-595; separates published June 18, 1909. This paper will be found of much interest to entomologists generally. It represents a good deal of careful work and will no doubt be of much use to students. The author states that the paper is an attempt to show the unity of thoracic structure that prevails throughout all the orders of insects. Thirty plates appear at the end of the paper and there are, besides, some figures in the text.

SWAINE, J. M. Catalogue of the Described Scolytidæ of America, North of Mexico. Appendix B., 24th Report of the State Entomologist on Injurious and other Insects of the State of New York, 1908, received Sept. 30, 1909. This catalogue covering 84 pages practically includes, the author states, all the literature published on the North American species of the family. 191 species are listed. It will be of much value to entomologists, especially those engaged in economic work. The author is to be congratulated on the result of his labour, and students generally will be grateful to Dr. Felt for publishing the catalogue.

The following is a list of the names and addresses of collectors heard from during 1909:—

Anderson, E. M., Provincial Museum, Victoria, B.C.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., care King Brothers, Quebec, Que.
Bush, A. H., 1105 Ninth Ave., Vancouver, B.C.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kalso, B.C.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Dent, W. A., Sarnia, Ont.
Dod, F. H., Wolley, Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fyles, Rev. T. W., Hull, Que.
Gibson, Arthur, Experimental Farm, Ottawa.
Groh, H., Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harms, J. F., Treesbank, Man.
Harrington, W. H., P.O. Department, Ottawa.
Harvey, R. V., Victoria, B.C.
Heath, E. F., Cartwright, Man.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph.
Keele, Jos., Geological Survey, Ottawa.
Keen, Rev. J. H., Metlakatla, B.C.
Letourneau, Jos. A., Experimental Farm, Ottawa
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancouver, B.C.
McIntosh, W., St. John, N.B.
Metcalfe, W., 288 Bank Street, Ottawa.
Moore, W. H., Scotch Lake, N.B.
Moore, G. A., 850 St. Hubert Street, Montreal.
Morris, Frank, Port Hope, Ont.
Nelles, Douglas H., Dept. Interior, Ottawa.
Perrin, Jos., McNab's Island, Halifax, N.S.
Rowland, Alton, Windsor Mills, Que.

Russell, John, Bon Accord, New Westminster, B.C.
Sanson, N. B., Banff, Alta.
Saunders, Henry, 21 Harbord Street, Toronto.
Sherman, R. S., 2285 Sixth Avenue, Vancouver, B.C.
Simpson, W., Dominion Observatory, Ottawa.
Southee, G. R., Sherbrooke, Que.
Swaine, J. M., Macdonald College, Que.
Taylor, Rev. G. W., Departure Bay, B.C.
Tipping, E. Dalton, Bluff Centre, Alta.
Venables, E. P., Vernon, B.C.
Walker, Dr. E. M., Harbord St., Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Willing, T. N., Regina, Sask.
Wilmot, E. S., Vernon, B.C.
Wilson, W. J., Geological Survey, Ottawa.
Winn, A. F., 32 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O. A. C., Quelph, Ont.

NOTES OF CAPTURES.

LEPIDOPTERA.

(Arranged according to Dyar's List of North American Lepidoptera, U.S. N.M. Bull. No. 52).

(Dyar's number).

5. *Iphidicles ajax* L. Pt. Pelee, Ont., 1 specimen, Sept. 6, (P. T. Taverner). On August 18, 1904, Dr. W. W. Newcomb, of Detroit, Mich., found this butterfly common at a patch of Papaw near Windsor, Ont. 15 eggs, 64 larvæ and chrysalids were found and 7 imagoes seen.

34. *Pintia* sisymbri Bdv. Fort Smith, Mackenzie, June 15, (Thompson and Preble).

63. *Eurymus hecla* Lefbr. On Island, north shore of Great Slave Lake, July 23, Long. 110°, (Thompson and Preble).

73. *Eurymus pelidne* Bdv. East end of Clinton-Golden Lake, Aug. 10; Artillery Lake, Aug. 13, (Thompson and Preble).

104. *Argynnis cornelia* Edw. Golden, B.C., June 24, (Wallis).

139. *Brenthis polaris* Bdv. On Island, near north shore of Great Slave Lake, July 23, (Thompson and Preble).

248. *Chlorippe clyton.* B. & LeC. Pt. Pelee, Ont., common, Aug. 14, 6 specimens taken, (P. A. Taverner).

289. *Œneis macounii* Edw. On Island, north shore of Great Slave Lake, July 23, (Thompson and Preble). A new locality for this interesting butterfly.

290. *Œneis nevadensis* Felder. Vernon, B.C., one specimen in the valley; the first I have seen, (Venables).

295f. *Œneis taygete* Hbn. East end of Clinton-Golden Lake, Aug. 10; on Island, north shore of Great Slave Lake, July 23, (Thompson and Preble).

362. *Mitoura damon* Cramer. Pt. Pelee, Ont., May 31, (Dr. W. W. Newcomb). Writing of this species, Dr. Newcomb says: "In walking along and disturbing low vegetation, mostly *Juniperus communis,* I discovered this handsome little butterfly. In about an hour in the middle of the day I secured 12 specimens, and my friend, Taverner, also caught several. One male was very dark above with just a suggestion of the brownish-yellow scales on the disk of the four wings and a trace of the same above and between the tails. I should class this as Brehme's *patersonia,* or at least as coming very close to it."

469. *Pamphila palæmon* Pallas. Sherbrooke, Que., July 1, (Southee).

644. *Hesperia centaureæ* Ramb. Fort Smith, Mackenzie, July 2, (Thompson and Preble).

683. *Ampelophaga versicolor* Harris. Britannia, near Ottawa, July 26, (Baldwin).

699. *Phlegethontius convolvuli* L., a *cingulata* Fab. Trenton, Ont. (Evans).

702. *Sphinx perelegans* Hy. Edw. Wellington, B.C., June 6, 7, (Taylor); Peachland, July 6, (Wallis).

704. *Sphinx luscitiosa* Clemens. Britannia, near Ottawa, July 9, 22; 2 specimens, (Baldwin).

728. *Marumba modesta* Harr. Artillery Lake, Aug. 13. (Thompson and Preble). A very northern record.

778. *Basilona imperialis* Dru. Go-Home-Bay, Ont., one specimen found in water, July 12, (Williams); Trenton, Ont., 1 sp. June 27, (Evans).

869. *Neoarctia yarrowi* Stretch. One female at rest on a rock in the hot sun on Mt. Huber, B.C., Aug. 9, about 8,000 feet above sea level, (Lyman).

960. *Panthea acronyctoides* Walk. Montmorency Falls, Que., June 23, (Lyman).

981. *Apatela cretata* Smith. Millarville, Alta., June 22 to July 16th, about 20 specimens at treacle, (Dod).

1,008. *Apatela funeralis* Grt. McNab's Island, Halifax, N.S., emerged June 20, (Perrin).

1,029. *Apatela sperata* Grt. Regina, Sask., June 15, (Willing).

1,042. *Apatela lanceolaria* Grt. Larva found on cherry at Saskatoon, Sask.; green with yellowish bristles from tubercles, one and three-quarter inches long; fed it on some rose leaves; pupated Aug. 1, moth emerged April 28, (Willing).

1,050. *Merolonche lupini* Grt. Duncans, B.C., one at light, (Hanham).

1,053. *Harrisimemna trisignata* Walk. Windsor Mills, Que. (Rowland); Hull, Que., full grown larva on ash, Aug. 28, (Groh).

1,075. *Baileya doubledayi* Gn. Windsor Mills, Que., (Rowland).

1,141. *Oligia grata* Hbn. Trenton, Ont., Oct. 18, (Evans).

1,147. *Hillia discinigra* Walk. Cartwright, Man., Aug. 24, (Heath).

1,211. *Hadena stipata* Morr. McNab's Island, Halifax, N.S., Sept. 13, (Perrin).

1,220. *Hadena vultuosa* Grt. Millarville, Alta., June 28, (Dod).

1,223. *Hadena morna* Strk. High River, Alta., (Baird).

Hadena commoda Walk, = *alberta* Smith. Millarville, Alta., June 22 to July 24, about 20 specimens at treacle. I have seen the type of *commoda* in the British Museum, and agree with Sir George Hampson in referring Prof. Smith's species here, (Dod).

1281. *Hyppa brunneicrista* Sm. Millarville, Alta., June 21 to 30, about 20 specimens at treacle, being more than I had ever seen altogether; mostly worn; I saw fewer *xylinoides,* (Dod).

1,286. *Momophana comstocki* Grt. McNab's Island, Halifax, N.S., June 11, (Perrin).

Oncocnemis poliochroa Hamp. Penticton, B.C., Aug. 10; Peachland, B.C., Aug. 7, (Wallis). A record for B.C., (Dod).

1,401. *Rhynchagrotis vittifrons* Grt. Penticton, B.C. (L. A. De Wolfe).

1,409. *Rhynchagrotis crenulata* Sm. Penticton, B.C. (L. A. De Wolfe).

1,413. *Adelphagrotis indeterminata* Walk. Duncans, B.C., August, at sugar, rare, (Hanham).

1,480. *Noctua conchis* Grt. Regina, Sask., July 11, (Willing).

Noctua patefacta Sm. Millarville, Alta., July 8 to Aug. 9, a few at treacle. The type of *juncta* Grt., which Sir George Hampson treats as distinct, came from Nova Scotia, and has a pale head and thorax, with dark, pale tipped collar. *Patefacta* has these parts dark, and nearly unicolorous. The variation, however, is towards *juncta,* and I doubt their distinctness, (Dod).

1,507. *Noctua flavotincta* Sm. Ucluelet, B.C., (Young).

1,514. *Noctua lubricans* Gn. Mt. St. Hilaire, Que., June 30, (Chagnon).

Noctua dislocata Sm. Millarville, Alta., July 10 to 24, a few at treacle, (Dod).

1,530. *Rhizagrotis albicosta* Sm. The specimen recorded from High River, in 1906, is the red costal form of *flavicollis* Sm., recorded in the next line from the same place. Specimens named *albicosta,* by Prof. Smith, in the British Museum, are an entirely dissimilar species, which I have not yet seen from Canada, (Dod).

1,682. *Paragrotis fuscigera* Grt. The specimen so recorded in the Record for 1908, from Olds, Alta., is the species listed as *pleuritica,* from Calgary. Both names are wrong for the species, which Sir George Hampson will shortly describe as new, (Dod).

1,724. *Paragrotis obeliscoides* Gn. Trenton, Ont., 2 sp., July 5, 1 sp. July 10, (Evans).

Mamestra artesta Sm. Winnipeg, Man., June 26, (Wallis).

1,782. *Mamestra lustralis* Grt. Sudbury, Ont., (Evans).

1,789. *Mamestra capsularis* Gn. Aweme, Man., June 18, 28, two specimens, (Criddle).

1,806. *Mamestra rubefacta* Morr. Millarville, Alta., one at treacle, June 25, (Dod).

1,827. *Mamestra obscura* Sm. Trenton, Ont., June 2, (Evans).

1,874. *Mamestra tacoma* Strk. Ottawa, June 6, (Gibson); Trenton, Ont., (Evans).

1,877. *Mamestra circumvadis* Sm. Millarville, Alta., one male at light, July 10 (Dod).

1,951. *Nephelodes pectinatus* Sm. Millarville, Alta., Aug. 17, at light, (Dod).

1,983. *Leucania calgariana* Sm. Millarville, Alta., a few at treacle, July 5 to 20, (Dod).

2,012. *Graphiphora culea* Gn. Trenton, June 14, (Evans).

2,072. *Aporophila yosemitae* Grt. Hymers, Ont., Sept. 12, (Dawson).

2,111. *Xylina thaxteri* Grt. Hymers, Ont., Sept. 2, (Dawson); McNab's Island, Halifax, N.S., June 12, (Perrin).

Cucullia indicta Sm. Millarville, Alta., one male, at Burgamot, Aug. 1, rare; this will probably prove to be synonymous with *obscurior* of Smith, (Dod).

Gortyna pallescens Sm. Millarville, Alta., one about Sept. 8, disturbed from a bunch of hay, a frequent method of capture in some previous years. My note in the Record for 1906 should have referred to this species and not *medialis* Sm., of which I have seen typical specimens from Colorado which look distinct, (Dod).

Gortyna thalictri Lyman. Aweme, Man., Oct. 1, (Criddle); a poor specimen of what I think is this species was taken this year at Winnipeg by Mr. Wallis. The variety *perobsoleta,* Lyman, was collected the past season at Hymers, Ont., by Mr. Dawson.

Gortyna nepheleptena Dyar. Ottawa, Sept. 23, (Fletcher); Oct. 17, (Gibson). The first Canadian records.

2,200. *Xanthia pulchella* Sm. Duncans, B.C., Sept., over 20 specimens taken at sugar. During previous residence of six years on Vancouver Island, had only taken two specimens, (Hanham).

2,214. *Tapinostola variana* Morr. Britannia, near Ottawa, July 28, (Baldwin); Trenton, Ont., another specimen taken July 31, (Evans).

2,221. *Orthosia ralla* G. & R. Trenton, Ont., Aug. 20, (Evans).

2,301. *Heliothis phlogophagus* G. & R. Winnipeg, Man., Oct. 2, (Wallis).

Polychrysia trabea Sm. Millarville, Alta., July 23 to Aug. 9, about thirty specimens, principally at flowers of Larkspur, on which the larva in all probability feeds. I have clusters of these flowers in my garden, but those growing wild attracted by far the greater number. These captures are an interesting discovery, as the food plant of *moneta* in Europe is Monkshood, which belongs to the same family. The only constant difference between the European and North American forms appears to be that the latter is slightly paler in colour. I have not seen typical Siberian *esmeralda,* (Dod).

2,481. *Eosphoropteryx thyatiroides* Gn. Duncans, B.C., a single specimen at bloom in my garden in 1908 and another in 1909; a rare visitant on Vancouver Island, (Hanham).

2,494. *Autographa rubidus* Ottol. Millarville, Alta., June 23 to July 5, six specimens, five of them at treacle. It is unusual for this genus to come to treacle in this district, and the capture of five specimens by this means suggests that I might have found the species common had I discovered its favourite flower, as I did *trabea,* (Dod).

2,528. *Autographa sackeni* Grt. Millarville, Alta., one worn specimen flying in sunshine, Aug. 1, (Dod).

2,529. *Autographa snowi* Hy. Edw. "Head of Pine Creek, Calgary" (the locality usually cited in this Record, with equal correctness, as "Millarville"), July 23, 1905, (Dod), and Mt. Athabasca, Alberta Rockies, July 31, 1907, (Mrs. Nicholl). Both specimens are in the British Museum and agree fully with the description and with Ottolengui's figure. So far as I know these are the first correct records from Canada. The resemblance to *sackeni* is very close, (Dod).

Syngrapha microgramma Hbn. Millarville, Alta., July 1 to 12, 1903 and 1904. This is the species erroneously recorded by me as *snowi* in Can. Ent., xxxvii, 45. I took a specimen to the British Museum and found that it fully agreed with European specimens, so that the name must now be added to our lists, (Dod).

2,540. *Ogdoconta cinereola* Gn. Cartwright, Man., 1 sp. Sept. 24, very rare here, (Heath); Winnipeg, Man., Sept. 20, (Wallis).

2,682. *Tarache cretata* G. & R. Trenton, Ont., June 14, 25, (Evans).

2,724. *Phalaenostola larentioides* Grt. Trenton, Ont., July 3, (Evans).

2,728. *Hyamia perditalis* Walk. Trenton, Ont., 2 sp. July 2, Aug. 3, (Evans).

2,769. *Meliopotis limbolaris* Geyer. McNab's Island, Halifax, July 16, (Perrin).

2,777. *Cirrhobolina deducta* Morr. Millarville Alta., one worn female at treacle, July 5; new to Alberta, and, I believe, a great rarity in Canada, (Dod).

2,825. *Catocala elda* Behr. Duncans, B.C., (Hanham).

2,836. *Catocala luciana* Hy. Edw. Cartwright, Man., Aug. 22, very rare, (Heath).

2,868. *Catocala piatrix* Grt. Pt. Pelee, Ont., Aug. 14, (P. A. Taverner).

2,990. *Homoptera minerea* Gn. Trenton, Ont., June 7, (Evans).

Pheocyma largera Sm. Penticton, B.C., (L. A. De Wolfe).

3,006. *Erebus odora* L. Pt. Pelee, Ont., Sept. 8, (P. A. Taverner); Quebec, Que., July 28, (Fyles); Brandon, Man., record sent by Mr. Willing.

3,038. *Philometra hanhami* Sm. Trenton, Ont., July 11, 29, (Evans). This is only the second time this species has been taken in the East.

3,136. *Heterocampa umbrata* Walk. Winnipeg, June 24, (Wallis).

3,159. *Cerura scitiscripta* Walk., a. *multiscripta* Riley. Winnipeg, June 22, (Wallis); Aweme, Man., (Criddle).

3,193. *Olene achatina* S. & A. Trenton, Ont., July 19, (Evans).

3,238. *Opheroptera boreata* Hbn. Trenton, Ont., Oct. 28, 29, two specimens, (Evans).

3,240. *Rachela bruceata* Hulst. Kaslo, B.C., (Cockle). New to British Columbia, (G. W. T.).

Rachela pulchraria Taylor. Kaslo, B.C., (Cockle).

3,272. *Eupithecia luteata* Pack. Trenton, Ont., 2 sp., July 22, Aug. 6, (Evans).

3,282. *Eupithecia albicapitata* Pack. One specimen labelled "E. Ontario," (Evans).

Eupithecia packardata Taylor. Trenton, Ont., Aug. 16, (Evans).

Eupithecia placidata Taylor. Kaslo, B.C., (Cockle).

Eupithecia agnesata Taylor. Kaslo, B.C., (Cockle).

Eupithecia terminata Taylor. Kaslo, B.C., (Cockle).

Eupithecia slocanata Taylor. Kaslo, B.C., (Cockle).

Eupithecia minorata Taylor. Kaslo, B.C., (Cockle).

Eupithecia adornata Taylor. Kaslo, B.C., (Cockle).

Eupithecia hanhami Taylor. Ucluelet, B.C., (Young).

Eupithecia harveyata Taylor. Ucluelet, B.C., (Young).

Eupithecia casloata Dyar. Ucluelet, B.C., (Young).

Eupithecia compactata Taylor, MS. Ucluelet, B.C., (Young).

Eupithecia albipunctata Haw. Ucluelet, B.C., (Young). This species is recorded in *Canadian Entomologist,* Dec., 1909, p. 428. I had not seen it from Vancouver Island before, (G. W. T.).

Eucymatoge togata Hbn. Departure Bay, B.C., (Taylor).

3,328. *Eucymatoge vitalbata* D. & S. Kaslo, B.C., (Cockle). New to British Columbia, (G. W. T.).

Eutephria lagganata Taylor. Laggan, B.C., (Dod).

Eutephria takirata Taylor. Takir R., B.C., (T. Bryant).

Aplodes unilinearia Taylor. Kaslo, B.C., (Cockle); Victoria, B.C., (Harvey).

Sciagraphia purcellata Taylor. Kaslo, B.C., (Cockle).

3,706. *Cymatophora bitactata* Walk. Kaslo, B.C., (Cockle). New to British Columbia, (G. W. T.).

3,734. *Cymatophora denticulodes* Hulst. Kaslo, B.C., (Cockle); Similkameen, B.C., (Harvey).

3,767. *Caripeta aequaliaria* Grt. Departure Bay, B.C., (Taylor).

3,835. *Selidosema separataria* Grt. Kaslo, B.C., (Cockle). New to British Columbia, (G. W. T.).

3,922. *Ennomos subsignarius* Hbn. Another visitation of these moths appeared at Ottawa on Aug. 5 and 6. Although great swarms were seen, the numbers did not seem so large as last year, (Groh). Mr. Winn, also, reports that the moths were abundant at Montreal, at intervals, in August.

4,040. *Leucobrephos brephoides* Walk. Winnipeg, Man., April 17, (Wallis).

4,043. *Callizzia amorata* Pack. Trenton, Ont., 2 sp., June 18, Aug. 1, (Evans).

4,274. *Lipocosma fuliginosalis* Fern. Trenton, Ont., 6 sp., July 2, 5, 11, 18, 29, (Evans).

Blepharomastix nymphulalis Haimback. St. Johns, Que., July 24, (Chagnon).

4,400. *Perispasta caeculalis* Zell. Trenton, Ont., 2 sp., June 14, 25, (Evans).

4,484. *Lineodes integra* Zell. Trenton, Ont., Sept. 13, (Evans).

Paralipsa terrenella Zell. Trenton, Ont., June 24, (Evans).

4,514. *Pyralis cuprina* Zell. Trenton, Ont., July 11, (Evans).

4,519. *Pyralis cohortalis* Grt. Trenton, Ont., June 27, July 29, (Evans).

4,546. *Schoenobius clemensellus* Rob. Trenton, Ont., July 1-29, (Evans).

4,560. *Crambus hamellus* Thunb. Kamouraska, Que., Aug. 19, (Winn).

4,566. *Crambus unistriatellus* Pack. Trenton, Ont., 2 sp., July 9, 26, (Evans).

4,574. *Crambus alboclavellus* Zell. Trenton, Ont., July 2-25, (Evans).

4,587. *Crambus ruricolellus* Zell. Trenton, Ont., 1 sp., July 3, (Evans).

Thaumatopsis gibsonella Kearf. Trenton, Ont., 1 sp., Sept. 5, (Evans). Second Ontario record.

4,599. *Crambus oregonicus* Grt. Departure Bay, B.C., (Young).

4,622. *Argyria auratella* Clem. Trenton, Ont., 3 sp. July 6, 9, (Evans).

4,632. *Chilo forbesellus* Fern. Trenton, Ont., 4 sp. July 11, 14, 27, 29, (Evans).

4,633. *Chalcoela aurifera* Zell. Trenton, Ont., 1 sp. July 22, (Evans).

4,698. *Mineola tricolorella* Grt. Trenton, Ont., 2 sp., July 2, 11, (Evans).

4,734. *Nephopteryx ovalis* Pack. Trenton, Ont., July 2-17, (Evans).

4,748. *Meroptera unicolorella* Hulst. Trenton, Ont., June 18, July 11, Aug. 17, (Evans).

4,835. *Euzophera ochrifrontella* Zell. Trenton, Ont., July 9, (Evans).

4,871. *Homœosoma mucidellum* Rag. Trenton, Ont., June 13, 20, July 25, Aug. 2, 23, (Evans).

4,886. *Moodna ostrinella* Clem. Trenton, Ont., June 17, (Evans).

4,888. *Moodna pelviculella* Hulst. Trenton, Ont., July 24-30, Aug. 14, (Evans).

4,973. *Pterophorus paleaceus* Zell. Trenton, Ont., 2 sp., June 20, 21, (Evans).

5,033. *Olethreutes capreana* Hbn. Trenton, Ont., 1 sp., July 2, (Evans).

5,057. *Olethreutes constellatana* Zell. Trenton, Ont., 2 sp., June 18, 22, (Evans).

Olethreutes removana Kearf. Trenton, Ont., 2 sp., July 3, 4, (Evans).

5,121. *Eucosma juncticiliana* Wlsm. Trenton, Ont., 3 sp., July 17, 23, Aug. 1, (Evans).

5,134. *Eucosma trigeminana* Steph. Trenton, Ont., 1 sp., June 20, (Evans).

5,140-1. *Eucosma obfuscana* Riley. Isle of Montreal, Que., June 13, (Chagnon). Closely allied to *E. scudderiana* Clem., and, like this species, the larvæ will be found making galls in the stems of aster, or goldenrod, (W. D. K.).

Eucosma landana Kearf. Redvers, Sask., (A. J. Crocker).

5,142. *Eucosma otiosana* Clem. Trenton, Ont., 7 sp., June 25, Aug. 30, (Evans).

5,167. *Thiodia aspidiscana* Hbn. Trenton, Ont., 5 sp., June 7, 13, 14, 22, (Evans).

Thiodia essexana Kearf. Trenton, Ont., 1 sp., June 12, (Evans).

Epinotia plumbolineana Kearf. Departure Bay, B.C., (Young).

5,248. *Ancylis burgessiana* Zell. Trenton, Ont., 2 sp., June 18, Aug. 6, (Evans).

5,253. *Ancylis angulifasciana* Zell. Trenton, Ont., 1 sp., July 11, (Evans).

Enarmonia vancouverana Kearf. Redvers, Sask., (A. J. Crocker).

5,295. *Melissopus latiferreanus* Walsm. Mt. St. Hilaire, Que., June 25, (Chagnon). The larvæ may be found during the winter in fallen acorns, usually in company with a Buprestid larva, also an Holocera larva. Sometimes all three may be found in the same acorn, (W. D. K.).

5,353. *Sparganothis flavibasana* Fern. Ottawa, larvæ again abundant on a few cultivated Loniceras, mature June 15, (Gibson).

5,387. *Platynota sentana* Clem. Trenton, Ont., 1 sp., June 27, (Evans).

5,396. *Tortrix pallorana* Rob. Trenton, Ont., 2 sp., Aug. 29, Sept. 5, (Evans).

5,406. *Tortrix fumiferana* Clem. Ottawa, thousands of the moths flying around trees and shrubs in the district, July 20, (Gibson).

5,435. *Phalonia smeathmanniana* Fab. Trenton, Ont., 7 sp., June 22, July 17, (Evans).

Histerosia cartwrightiana Kearf. Trenton, Ont., 1 sp., June 27, (Evans).

5,496. *Cerostoma cervella* Wlsm. Departure Bay, B.C., (Young).

5,661. *Trichotaphe nonstrigella* Cham. Trenton, Ont., 6 dates, June 21-Sept. 23, (Evans).

Gelechia viduella Fab. Banff, Alta., 1 sp. (Sanson). An arctic species, very rarely found, described as *labradoriella* by Clemens, from specimens collected by Packard. There seems to be no other record of its capture since 1863, (W. D. K.).

5,818. *Gelechia ornatifimbriella* Clem. Trenton, Ont., 9 dates, June 14—July 2. (Evans).

Psilocorsis fletcherella Gibson. Ottawa, 2 sp. emerged from larvæ found on *Populus tremuloides* June 10, (Gibson).

6,110. *Scythris impositella* Zell. Ottawa, Mer Bleue, (Young).

6,495. *Tinea biflavimaculella* Clem. Trenton, Ont., 2 sp., July 3, Sept. 5, (Evans).

6,606. *Sthenopis thule* Strk. Macdonald College, Que., larvæ and pupæ found near here in bases of the stems of *Salix petiolaris*, June 29, (Swaine and Chagnon).

COLEOPTERA.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico).

28. *Cicindela fulgida* Say. Peachland, B.C., (Wallis).

30*a*. *Cicindela limbata* Say. Radisson, Sask., July 27, (Fletcher).

34*a*. *Cicindela terricola* Say. Westbourne, Man., Aug. 24, (Wallis). New to Manitoba.

167. *Loricera caerulescens* L. Aweme, Man., (Criddle).

305. *Bembidium carinula* Chd. Winnipeg Beach, Man., July 9, (Wallis).

351. *Bembidium lucidum* Lec. Winnipeg, Man., May 6, (Wallis).

569. *Pterostichus caudicalis* Say. Winnipeg, May 8, (Wallis).

623. *Amara avida* Say. Winnipeg, Sept. 9, (Wallis).

626. *Amara rufimanus* Kirby. Westbourne, Man., Aug. 5, (Wallis).

629. *Amara laticollis* Lec. Winnipeg, Aug. 8, (Wallis).

650. *Amara apricarius* Payk. Trenton, Ont., 4 specimens, July 4, 11, 23, Aug. 5, (Evans).

742. *Calathus gregarius* Say. Westbourne, Man., Aug. 14, (Wallis).

777. *Platynus anchomenoides* Rand. Aweme, Man., (Criddle).

804. *Platynus basalis* Lec. Aweme, Man., (Criddle).

836. *Platynus nigriceps* Lec. Radisson Sask., July 29, (Willing).

871. *Lebia divisa* Lec. Last Mountain Lake, Sask., June 5, (G. C. McBean).

898. *Lebia depicta* Horn. Makinak, Man. Record sent by Mr. Chagnon, of Montreal.

Colymbetes rugipennis Sharp. Winnipeg, Sept. 19, (Wallis). Mr. Roberts, of New York, who identified the species, writes: "You will find this placed as a synonym of *sculptilis;* this is an error. I can prove it to be a good species."

925. *Callida purpurea* Say. Wilkie, Sask., July 16, (Willing).

947. *Cymindis borealis* Lec. Aweme, Man., (Criddle).

1,450. *Agabus clavatus* Lec. Vernon, B.C., (Venables).

1,484. *Dytiscus marginicollis* Lec. Winnipeg, April 24, (Wallis).

1,500. *Graphoderes occidentalis* Horn. Winnipeg, (Wallis).

1,505. *Gyrinus minutus* Fab. Winnipeg, Sept. 11, (Wallis).

1,551. *Helophorus inquinatus* Mann. Winnipeg, May 5, (Wallis).

1,597. *Hydrocharis obtusatus* Say. Winnipeg, June 3, (Wallis).

1,679. *Cercyon unipunctatum* L. Regina, Sask., in house, Nov., (Willing).

1,729. *Choleva basillaris* Say. Aweme, Man., (Criddle).

1,735. *Ptomaphagus consobrinus* Lec. Aweme, Man., (Criddle).

1,743. *Ptomaphagus brachyderus* Lec. Aweme, Man., (Criddle).

1,866. *Ceophyllus monilis* Lec. Aweme, Man., (Criddle).

Coccidula occidentalis Horn. Aweme, Man., (Criddle).

2,098. *Quedius explanatus* Lec. Olds, Alta., in a turnip, Sept. 12, (Willing).

2,234. *Philonthus aurulentus* Horn. Vernon, B.C., (Venables).

3,037. *Megilla vittiger* Mann. Saskatoon, Sask., June 1; Olds, Alta., Sept. 12, (Willing).

3,072. *Harmonia 12-maculata* Gebl. Last Mountain Lake, Sask., 3 specimens, each a different colour, June 5, (G. A. McBean).

3,095*d*. *Brachyacantha albifrons* Say. Meota, north of Battleford, Sask., Aug. 8, (Willing).

3,122. *Hyperaspis 4-vittata* Lec. Last Mountain Lake, Sask., June 5, (G. A. McBean).

Hyperaspis inflexa Casey. Last Mountain Lake, Sask., June 5, (G. A. McBean).

3,189. *Mycetina testacea* Ziegl. Regina, Sask., Aug. 28, (Willing).

3,238. *Tritoma californica* Lec. Olds, Alta., (Willing).

3,355. *Telmatophilus americana* Lec. Aweme, Man., (Criddle).

3,421. *Dermestes talpinus* Mann. Olds, Alta., (Willing).

3,425*a*. *Dermestes signatus* Lec. Olds, Alta., (Willing).

3,477. *Hister harrisii* Kirby. Aweme, Man., June, July, (Criddle); Westbourne, Man., Aug., (Wallis).

3,505. *Hister sedecimstriatus* Say. Aweme, June, (Criddle).

3,508. *Hister perplexus* Lec. Aweme, Man., June, (Criddle).

2,615. *Saprinus seminitens* Lec. Aweme, Man., July, (Criddle).

3,617. *Saprinus fraternus* Say. Aweme, Man., July, (Criddle).

3,895. *Byrrhus murinus* Fab. Aweme, Man., (Criddle).

4,282. *Agriotes fucosus* Lec. Winnipeg, July 7, (Wallis).

4,322. *Melanotus fissilis* Say. Westbourne, Man., Aug. 14, Wallis).

4,382. *Pityobius anguinus* Lec. Winnipeg Beach, Man., July 9, (Wallis).

4,607*a*. *Buprestis langii* Mann. Banff, Alta., July 16, (Sanson).

4,810. *Lucidota atra* Fab. Norman, Ont., July 19, (Wallis).

5,235. *Gibbium scotias* Scop. Montreal, June, (Chagnon).

5,296. *Xyletinus lugubris* Lec. Aweme, Man., (Criddle).

5,337. *Endecatomus rugosus* Rand. Aweme, Man., (Criddle).

5,356. *Amphicerus bicaudatus* Say. Regina, Sask., Sept. 17, Oct. 6, (Willing).

5,428. *Canthon praticola* Lec. Mortlach, Sask., in dead gophers, May 31, (Willing).

5,705. *Diplotaxis obscura* Lec. Vernon, B.C., (Venables).

5,960. *Prionus pocularis* Dalm. Trenton, Ont., July 13, (Evans).

6,007. *Merium proteus* Kirby. Vernon, B.C., (Venables).

6,184. *Xylotrechus annosus* Say. Regina, Sask., June 12; Strathcona, Alta., May 20, (Willing).

6,253. *Anthophylax malachiticus* Hald. Mt. St. Hilaire, Que., May 24, (Chagnon).

6,266. *Acmæops subpilosa* Lec. High River, Alta, June 27, (Willing).

6,278. *Gaurotes cressoni* Bland. Vernon, B.C., on wild rose flowers, Aug., (Venables).

6,358. *Leptura scripta* Lec. Vernon, on wild rose, (Venables).

6,385. *Monohammus titillator* Fab. Trenton, Ont., Aug. 9, (Evans).

6,488. *Saperda moesta* Lec. Garden Hill, near Port Hope, Ont. Middle July, on poplar, (Morris).

6,489. *Saperda concolor* Lec. Bethel, near Port Hope, Ont. Middle June, on willow, (Morris).

6,659. *Pachybrachys litigiosus* Suffr. Aweme, Man., July 9, (Criddle).

6,684. *Pachybrachys nigricornis* Say. Aweme, Man., July 19, only one specimen taken, (Criddle).

6,707. *Diachus auratus* Fab. Aweme, Man., Aug. 18, 25, (Criddle).

6,742. *Chrysochus cobaltinus* Lec. Enderby, B.C., Aug. Several on heads of timothy grass, (Venables).

6,796. *Chrysomela conjuncta* Rog. Last Mountain Lake, Sask., June 5, (G. A. McBean).
6,968. *Haltica evicta* Lec. Aweme, Man., (Criddle).
7,032. *Mantura floridana* Cr. Aweme, Man., May 28, on *Rumex venosus,* (E. Criddle).
7,096. *Physonota unipunctata* Say. Qu'Appelle Valley, July, (Halkett).
7,402. *Haplandrus femoratus* Fab. Montreal, (Chagnon).
Vanonus wickhami Casey. Trenton, Ont., July 18, (Evans).
7,464. *Tribolium madens* Charp. Vernon, B.C., (Venables).
8,224. *Attelabus analis* Ill. Aweme, Man., (Criddle).
8,228. *Attelabus rhois* Boh. Aweme, Man., (Criddle).
8,334. *Scythropus elegans* Coup. Vernon, B.C., beaten from pine trees, (Venables).
8,430. *Phytonomus comptus* Say. Aweme, Man., on *Rumex venosus,* (Criddle); pupa on head of grass, Indian Head, emerged Regina, Sask., Aug. 1, (Willing).
8,540. *Grypidius equiseti* Fab. Winnipeg, Man., May 23, (Wallis).
8,641. *Anthonomus sycophanta* Walsh. Regina, Sask., June 10; reared from gall on willow leaf, Olds, Alta., Sept. 5, (Willing).
8,688. *Encalus decipiens* Lec. Aweme, Man., May 28, (Criddle).
8,943. *Limnobaris prolixa* Lec. Aweme, Man., (Criddle).
8,948. *Limnobaris prolexus* Lec. Aweme, Man., (Criddle).
9,199. *Hylurgops pinifex* Fitch. Winnipeg, May 9, (Wallis).
9,207. *Allandrus bifasciatus* Lec. Aweme, Man., (Criddle).
9,315. *Philhydrus hamiltoni* Horn. Norman, Ont., July 19, (Wallis).
Actium retractum Casey. Queen Charlotte Island, B. C., (Keen).
Oropus keeni Casey. Metlakatla, B.C., (Keen).
Oropus brevipennis Casey. Metlakatla, B.C., (Keen).
Batrisodes albionicus Aubé. Metlakatla, B.C., (Keen).
Baryodma rotundicollis Casey. Queen Charlotte Island, B.C., (Keen).
Baryodma insulana Casey. Queen Charlotte Island, B.C., (Keen).
Eucharina sulcicollis Mann. Queen Charlotte Island, and Metlakatla, B.C., (Keen).
Megista granulata Mann. Queen Charlotte Island, B.C., (Keen).
Thinusa fletcheri Casey. Queen Charlotte Island, B.C., (Keen).
Amblopusa borealis Casey. Queen Charlotte Island, (Keen).

DIPTERA.

(Arranged according to a Catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI., No. 1,144. The numbers refer to the pages of the catalogue.)

Collectors who other years devoted a good deal of time to these insects have omitted to send in records. It is hoped, however, when the past season's collections are worked up, that notes relating to the rarer species will be sent for inclusion in next year's Record.

87. *Chionea nivicola* Doane. Banff, Alta., on snow, March 29, (Sanson).
105. *Dixa centralis* Loew. Banff, Alta., June 22, (Sanson).
Anopheles occidentalis D. & K. Valley of Mayo River, Y.T., Lat. 63° 45′, Long. 136°, 1904, (Keele). Probably the most northerly record for an *Anopheles* (H. G. D.); Aweme, Man., April 23, 24, (Criddle).

127. *Aedes canadensis* Th. Youghall, N.B., July, (Gibson).
129. *Culiseta impatiens* Walk. Valley of Mayo River, Y.T., Lat. 63° 45′, Long. 136°, 1904, (Keele).
129. *Culiseta inornatus* Will. Aweme, Man., May 17, 21, Sept. 27, Oct. 12, 14, (Criddle).
131. *Aedes provacans* Walk. Youghall, N.B., July, (Gibson).
Aedes sansoni D. & K. Banff, Alta., June 22, (Sanson).
Aedes punctor Kirby. Banff, Alta., June 22, (Sanson).
Aedes pagetonotum D. & K. Ottawa, May 20, 1905, (Fletcher); Chelsea, Que., May 17, (Gibson); Aweme, June 3, (Criddle).
Aedes riparius D. & K. Aweme, Man., June 1, 2, 24, (Criddle).
131. *Aedes sylvestris* Th. Aweme, Man., June 25, July 19, (Criddle); Youghall, N.B., July, (Gibson).
133. *Aedes spenceri* Th. Aweme, Man., May 17, June 10, (Criddle).
Mansonia perturbans Walk. Aweme, Man., June 30, (Criddle).
182. *Stratiomyia badia* Walk. Beaver Lake, Alta., July, (Halkett).
185. *Odontomyia binotata* Loew. Aweme, Man., Aug. 25, (Fletcher).
359. *Platychirus chætopodus* Will. Metiakatla, B.C., (Keen).
360. *Melanostoma angustatum* Will. Kaslo, B.C., Aug. 16, (Fletcher).
363. *Didea laxa* O.S. Fort Simpson, B.C., Aug. 18, (Keen).
365. *Syrphus diversipes* Macq. Hampton, P.E.I., Aug. 20, (Gibson).
Syrphus perplexus Osburn. Millie Lake, Hudson Bay Slope, July 27, (Wilson).
367. *Syrphus protritus* O.S. Metlakatla, B.C., (Keen).
368. *Syrphus xanthostoma* Will. Hampton, P.E.I., Aug. 20, (Gibson); Ottawa, Sept. 4, (Groh).
382. *Sericomyia chrysotoxoides* Macq. Youghall, N.B., July 6, (Gibson).
393. *Helophilus hamatus* Loew. Ottawa, May 13, (Fletcher).
568. *Scatophaga furcata* Say. Banff, Alta., on Sulphur Mountain, May, (Sanson).

HEMIPTERA.

In this order some good work has been done during the year by Mr. Geo. A. Moore, of Montreal. Other collectors who previously have devoted considerable time to collecting hemiptera have either omitted to send in records, or have not as yet been able to work up their season's catch. Mr. Moore spent the latter half of July at North Hatley, Que., and among the material which he collected the following, although most of the species may not be particularly uncommon, are of interest, as few definite records from that part of the Province of Quebec are available. All the specimens were collected between the 17th and 31st July, at North Hatley, and were not of common occurrence:

Entilia sinuata, Fab.
Lamenia vulgaris, Fitch.
Laccocera vittipennis, Van D.
Pissonotus marginatus, Van D.
Aphrophora quadrinotata, Say.
Agallia 4-punctata Prov.
Oncometopia lateralis Fab.
Gypona quebecensis Prov.
Corimelaena unicolor, P. B.
Perillus circumcinctus, Stal.
Homoemus aeneifrons, Say.
Podisus modestus, Dall.
Mormidca lugens, Fabr.
Peribalus limbolaris, Stal.
Elasmostethus cruciata, Say.
Corizus nigrosternum, Sign.
Corizus novae-boracensis, Sign.
Nysius angustatus, Uhl.
Oedancala dorsalis, Say.
Lopidea media, Say.
Resthenia insignis, Say.
Lygus pabulinus, L.

Neurocolpus nubilis, Say.
Poeciloscytus basalis, Reut.
Capsus ater, L.
Dicyphus famelicus, Uhl.
Diaphnidia pellucida, Uhl.
Pilophorus amoenus, Uhl.
Rhinocapsus vanduzei, Uhl.
Coriscus subcoleoptratus, Kirby.
Gerris rufoscutellatus, Latr.
Rhagovelia obesa, Uhl.
Salda ligata, Say.
Salda pallipes, Fabr.

Besides the above, the following records are of interest, those species taken by Mr. Metcalfe, being new to the Ottawa list:

Livia maculipennis Fitch. Ottawa, on pine, April 30, (Metcalfe).

Livia vernalis Fitch. Ottawa, on pine, April 30, (Metcalfe).

Aphalara calthae Linn. Hull, Que., May 10, (Metcalfe).

Aphalara marginata Harris. Hull, Que., June 7, (Metcalfe).

Psylla carpini Fitch. Hull, Que., on ironwood, Aug. 25, (Metcalfe).

(The above species of Psyllidae were named by Mr. E. A. Schwarz, of Washington. A number of other species besides these were collected, but Mr. Schwarz reported them to be undescribed.)

Gypona albosignata Uhl. Trenton, Ont., Sept. 5, 1 sp., rare, (Evans).

Athysanus striola Fall. Trenton, Ont., June 18, 2 sp., rare, (Evans).

Athysanus instabilis Van D. Trenton, Ont., 5 sp., June 23, July 21, 23, 28, Aug. 1, (Evans).

Sehirus cinctus P. B. Large numbers of this insect were seen by Miss A. M. Rand, at Canaan, N.S., in early April, chiefly being clustered on old leaves under, and near, apple trees. Its occurrence in such large numbers seems to me should be recorded, as it is not a common habit among the Pentatomidæ. Mr. Van Duzee says this is the second instance known to him of this insect appearing in large numbers.

Corynocoris distinctus Dall. Sudbury, Ont.; Eldorado, Ont., Sept. 1, (Evans).

Alydrus pluto Uhler. Crow's Nest Pass, B.C., (W. S. Drury).

Alydrus conspersus Mont. Trenton, Ont., (Evans).

Alydrus scutellatus Van D. Crow's Nest Pass, B.C., (W. S. Drury).

Protenor belfragei Hagl. Sudbury, Ont.; Eldorado, Ont., Sept. 1, (Evans).

Phlegyas abbreviatus Uhler. Belleville, Ont., (Evans).

Corizus crassicornis L. Sudbury, Ont., June 23; Hastings Co., Ont., June 26, (Evans).

Cymus luridus Stal. Trenton, Ont., Aug. 17, (Evans).

Ligyrocoris diffussus Uhler. Trenton, Ont., Sept. 1, (Evans).

Ligyrocoris contracta Say. Crow's Nest Pass, B.C., (W. S. Drury).

Geocoris bullatus Say. Belleville, Ont., (Evans); N.W.T., (J. Macoun); Crow's Nest Pass, B.C., (W. S. Drury).

Resthenia insitiva Say. Belleville, Ont., (Evans).

Diaphnidia debilis Uhler. Trenton, Ont., Sept. 3, (Evans).

Labops burmeisteri Stal. Sudbury, Ont., 1 sp., (Evans). Mr. Van Duzee remarks, "is new to the Canadian list, and, in fact, new to this continent, so far as published records are concerned. I have seen one more specimen, which was taken in the Adirondacks last summer. It was described from specimens taken in Siberia and Kamschatka."

Reduviolus roseipennis Reut. Trenton, Ont., June 7, Sept. 16, (Evans).

Pygolampis pectoralis Say. Trenton, Ont., (Evans).

ORTHOPTERA.

During 1909, Dr. E. M. Walker has examined several small collections of Orthoptera for Canadians. Among these are some species which he considers should

Labia minor Burm. Aweme, Man., June 18, 28, 29, 3 males, 2 females; Sept. 11, 5 males, 2 females, (Criddle).

Chloealtis abdominalis Thomas. Regina, Sask., Sept. 5, 1 female, macropterous, (Willing).

Arphia xanthoptera Burm. There is a specimen of this insect in the collection of the late Dr. Wm. Brodie, labelled Toronto, 1880. It does not appear to be found about Toronto at the present time, but will doubtless be found on the southern strip along Lake Erie. New to Canada, (E. M. W.).

Spharagemon bolli Scudd. Aweme, Man., July 27, 1904, 1 female, (Criddle).

Spharagemon collare Scudd. Aweme, Man., Aug. 2, 1904, 1 male, (Criddle). This specimen is remarkably uniform in coloration, closely resembling *S. bolli* in appearance, (E. M. W.).

Ceuthophilus latens Scudd. There is a male of this species in the collection of the Ontario Agricultural College, Guelph, labelled, London, Ont. New to Canada, (E. M. W.).

Oecanthus quadripunctatus Beut. Aweme, Man., Aug. 21, 26, (Criddle).

ODONATA.

Dr. E. M. Walker, of Toronto, has been good enough to send the following notes, all of which he thinks are worthy of recording in the Record:

Calopteryx aequabilis Say. Kenogami River, Hudson Bay Slope, Ont., July 7, 8, Aug. 7, 8, 1904, 4 males (Wilson). These specimens are somewhat stouter than those from more southern localities. They belong to the form described by Hagen as *C. hudsonica.*

Agrion resolutum Selys. Regina, Sask., June 20, (Willing).

Ischnura cervula Selys. Peachland, B.C., Aug. 20, (Wallis).

Ophiogomphus occidentis Hagen. Peachland, B.C., Aug. 6, 2 males, Aug. 17, 1 female, July 8, 1 male, (Wallis). New to Canada, (E. M. W.).

Gomphus descriptus Banks. Guelph, Ont., May 27, 1908, 1 male, (A. W. Baker). New to Canada, (E. M. W.).

Gomphus externus Selys. Aweme, Man., June 22, 1 male, (Criddle); Winnipeg, Man., (Wallis). New to Canada, (E. M. W.).

Aeshna umbrosa Walker. Winnipeg, Man., Sept. 6, (Wallis).

Aeshna eremita Scudder. Peachland, B.C., Aug. 3, 2,500 ft., 1 female; Aug. 7, 1 female, (Wallis).

Aeshna sitchensis Hagen. Winnipeg, Man., Sept. 6, 1 male, (Wallis).

Macromia magnifica Selys. Peachland, B.C., July 24, 31, 2 males (Wallis). Determined by Mr. E. B. Williamson. New to Canada, (E. M. W.).

Tetragoneuria canis McLachlan. Sudbury, June 26, 1892; June 11, 1893, 2 males, (Evans).

Somatochlora albicincta Burm. Aweme, Man., June 22, 1 female, (Criddle).

Cordulia shurtleffi Scudder. Sudbury, Ont., June 11, 1893, 2 males, (Evans).

Leucorhinia frigida Hagen. Sudbury, Ont., June 26, 1892, 1 male, 1 female, (Evans).

Leucorhinia hudsonica Selys. Winnipeg, June 19, 1 male, 2 females, (Wallis).

Leucorhinia proxima Calvert. Winnipeg, June 19, 1 male, (Wallis).

Leucorhinia borealis Hagen. Banff, Alta., (Sanson); again taken at Aweme, Man., June 4, 9, 2 females, (Criddle).

Leucorhinia intacta Hagen. Winnipeg, June 19, 2 males, (Wallis).

In addition to the above, Dr. Walker has written that he has several undetermined species received from Mr. J. B. Wallis, of Winnipeg, Man. Most of these have been examined, also, by Mr. E. B. Williamson, but seem for the most part to be undescribed. They include an *Argia* from Peachland, B.C., (several specimens), a single female of a peculiar *Gomphus*, from the same locality, and 3 females of a *Somatochlora*, related to *franklini* and *macrotona*, but probably distinct. Dr. Walker also adds: "Among a number of Odonata used for class purposes, in the collection of the Ontario Agricultural College, Guelph, are a single *Perithemis domitia* Drury, and several specimens each of *Libellula vibrans* Fab., and *L. auripennis* Burm. These specimens are unlabelled, but Mr. Caesar, of the Entomological Department, thinks that they were certainly taken in the vicinity of Guelph. They cannot be recorded as undoubted inhabitants of Ontario, but should be looked for by collectors in the southern part of the province.

NEUROPTEROID INSECTS. (EXCEPT ODONATA.)

With the publication of the list of some Canadian neuropteroid insects, exclusive of Odonata, in the Record for 1908, it was hoped that more work would be done in these groups in 1909. Mr. J. B. Wallis, of Winnipeg, has made another small collection, but all of these have not, as yet, been worked up. During the past year a miscellaneous lot of specimens has been determined by Dr. Banks, and it has been thought advisable, owing to the few authentic records of these insects in Canada, to include the entire list. There is much work to be done yet before we will have even a fair idea of the range of species which occur in Canada. The numbers below refer to the pages in Banks' Catalogue, published in 1907, by the American Entomological Society.

ARCHIPTERA.

15. *Polymitarcys albus* Say. Winnipeg, Man., Sept. 6, (Wallis).

15. *Hexagenia bilineata* Say. Norman, Ont., July 19, (Wallis).

16. *Hexagenia limbata* Pict. Winnipeg, July 3, (Wallis); Norman, Ont., subimagoes, July 19, (Wallis).

16. *Ephemera simulans* Walk. Ottawa, June 5, (Groh); Norman, Ont., July 19, (Wallis).

20. *Heptagenia interpunctata* Say. Norman, Ont., July 19, (Wallis).

21. *Heptagenia terminata* Walsh. Norman, Ont., July 19, (Wallis).

27. *Chrysopa chlorophana* Burm. Winnipeg, Man., Sept. 8, (Wallis).

27. *Chrysopa coloradensis* Banks. Peachland, B.C., Aug. 8, (Wallis).

Meleoma verticalis Banks. Penticton, B.C., Aug. 11, (Wallis).

29. *Myrmeleon immaculatus* De G. Penticton, B.C., Aug. 11, (Wallis).

30. *Brachynemurus abdominalis* Say. Okanagan Falls, B.C., Aug. 13, (Wallis).

31. *Brachynemurus brunneus* Currie. Peachland, B.C., Aug., (Wallis).

NEUROPTERA.

33. *Panorpa rufescens* Ramb. Ottawa, July 14, (Gibson).

TRICHOPTERA.

35. *Phryganea cinerea* Walk. Rostrevor, Ont., Sept. 11, (Gibson); Regina, Sask., July 15, (Fletcher); Winnipeg, Man., June 25, (Wallis).

35. *Phryganea vestita* Walk. Sable Island, Aug. 16, (collector unknown).

35. *Neuronia angustipennis* Hagen. McLeod, Alta., June 30, (Fletcher).

35. *Neuronia postica* Walk. London, Ont., July 7, (A. P. Saunders).

36. *Limnephilus luteolus* Banks. Peachland, B.C., Aug. 8, (Wallis).

37. *Limnephilus submonilifer* Walk. Ottawa, Sept. 19, (Gibson), Sept. 26, (Letourneau); Rostrevor, Ont., Sept. 5, (Gibson).

38. *Pycnopsyche scabripennis* Ramb. Rostrevor, Ont., Sept. 4, (Gibson).

39. *Stenophylax pacificus* Banks. Peachland, B.C., Aug. 21, (Wallis).

39. *Platyphylax subfasciata* Say. Ottawa, Sept. 21, (Letourneau).

Platyphylax alaskensis Banks. Bartlett Bay, off Glacier Bay, Alaska, June 1, (Nelles).

41. *Apatania pallida* Hagen. Winnipeg, Man., Oct. 1, (Wallis).

42. *Brachycentrus nigrisoma* Banks. Winnipeg, Man., May 28, (Wallis).

45. *Molanna cinerea* Hagen. Rostrevor, Ont., Sept. 2, (Gibson).

45. *Triaenodes flavescens* Banks. Ottawa, June 25, (Gibson).

46. *Mystacides sepulchralis* Walk. Ottawa, Aug. 8, (Fletcher); Norman, Ont., July 19, (Wallis).

47. *Macronema zebrata* Hagen. St. Anne de Bellevue, Que., July 23, (Fletcher).

47. *Hydropsyche scalaris* Hagen. Norman, Ont., July 19, (Wallis).

47. *Hydropsyche sordida* Hagen. Ottawa, July 15, (Gibson).

ARANEIDA.

The Rev. J. H. Keen, of Metlakatla, British Columbia, made a small collection of spiders, which were submitted to Dr. Nathan Banks. The list of determinations is of interest, owing to the locality, and to the fact that it adds considerably to the known range of some of the species. Dr. Banks considers the records all worth publishing. Unfortunately, no dates are given on which the specimens were collected. There is a good deal of work to be done yet in Canada in finding out what species of spiders we have, and many of our collectors, particularly those living in little worked localities, could help very much in adding to the known distribution of these creatures. The following, all of which were found at Metlakatla, constitute the list:

Epeira patagiata, Clerck.
Epeira displicata, Htz.
Epeira californiensis, Keys.
Zilla californica, Bks.
Labulla altioculata Keys. Not common, (N. B.).
Linyphia phrygiana, Koch.
Linyphia marginata, Koch.
Pedanostethus laticeps Keys. Previously known to me by a few specimens only, (N. B.).
Lophocarenum florens, Cambr.
Tetragnatha extensa, Linn.
Tetragnatha laboriosa, Hentz.
Apostenus cinctipes, Banks. Previously known to me by a few specimens only, (N. B.).
Clubiona pacifica, Banks.
Thanatus rubicundus, Keys.
Cybaeus reticulatus, Simon.
Amaurobius pictus, Simon.
Lycosa brunneiventris, Banks.
Pardosa glacialis, Thorell.
Dendryphantes bifida, Banks.
Sclerobunus brunneus, Banks.
Ideobisium threveneti, Simon.

IN MEMORIAM—DR. WILLIAM BRODIE.

We regret to have to record the death of another veteran entomologist, in the person of the late Dr. William Brodie, who has recently been contributing a series of articles on galls found in the neighborhood of Toronto. On Saturday, July 31st, he complained of feeling unwell on his return to his home, and a few days later became seriously ill. On Friday, August 6th, he expired. He was born in Peterhead, Aberdeen, Scotland, and came out to Canada with his parents when a child. His father settled on a farm in the County of York about thirty miles from Toronto, and there hewed out of the forest a home for his family. From his earliest years Dr. Brodie exhibited an ardent love of nature in all its aspects, and became an omnivorous reader. This habit formed in childhood continued with him throughout his life. While fitting himself for the profession of dentistry he taught school for a time and became one of the first graduates of the Dental College in Toronto. There he practised his profession very successfully for a long series of years. In 1903, he gave up his work and took charge of the Biological Department of the Provincial Museum. While fully occupied during most of his time with the work of his profession, he most industriously devoted every spare moment to his much-loved study of Entomology. Galls and their inmates had a special fascination for him, and he made large collections of these and many other forms of insect life. His enthusiasm was infectious and inspired many of his younger friends with a love for nature, and especially for the collection and observation of insects. He died at the good old age of seventy-eight years and will be very much missed, not only by the members of his family, but by a large circle of friends. His work at the Museum was most congenial to him, and gave him a happy occupation when his age prohibited him from carrying on his ordinary work. Of his family of six children, three daughters alone survive. To them we extend our deepest sympathy.

I.

Ah! you who own the sovereign sway
Of commerce and the busy mart,
You knew him not, he lived apart,
The king who passed in state to-day.

A king who recked not worldly gear,
A pauper—you who rate by gold,
But rich in knowledge manifold,
In Nature's lore without a peer.

He lived his threescore years and ten;
He had his court of liegemen true;
They loved him, like that chosen few
Who served the Master scorned of men.

"He is no king of ours," you say,
"We know him not"; yet bare the head,
Pay you your tribute, he is dead,
I saw him pass in state to-day.

II.

To bow the knee he was not planned
With willowy grace and pliant form;
Like stalwart oak he faced the storm
And bore the brunt—a monarch grand.

A shock of rebel locks upreared
Above the forehead bold and high;
'Neath shaggy brow the deep-set eye
Challenged enquiry; grizzled beard

Part hid his lip; a man endued
With power of thought, you read the face;
The Maker moulds in some for grace,
For strength those rugged features hewed.

In mind and will maturest man,
A boy at heart; his eager quest
Of Nature's ways the boy confessed,
But through it all endurance ran.

Bend as they might the sturdy frame
And quell the lustre of the eye,
Not years could daunt the purpose high
Or quench the ardent spirit's flame.

III.

Greybeard and youth, a thoughtful throng,
Would gather round their Scottish sage,
Right gladly youth give place to age,
Listen and learn and ponder long.

Was life's dark riddle hard to read?
His vibrant tones would cheer. Were there
Who questioned truth? who fought despair?
He welcomed all, nor asked their creed.

Did they in earnest seek? He sought
In earnest too. From bounteous store
He loved with lavish hand to pour
Jewels of knowledge and of thought.

Responsive hearts, unwavering eyes
His steadfast gaze compelled again;
He loved the truth, his speech was plain,
He could not stoop to compromise.

IV.

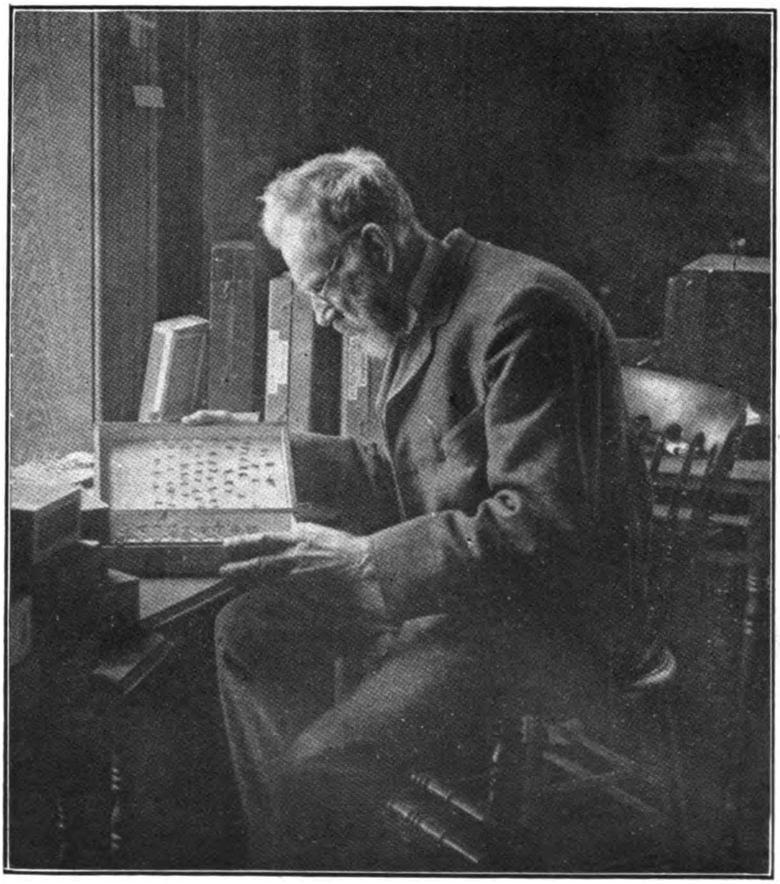
Oh! all too rare the thoughtful mind
That keeps abreast of Science way
And still reveres the older day,
The simpler faith that lags behind.

Dead now, but while the ages run
His work shall live; 'tis such as he
Alone inspire posterity,
Fathering their kind from son to son.

We know not when our days are sped,
And I, who through his friendship stand,
Would lift some falterer by the hand
Ere I lie nerveless with the dead.

Trinity College School, Port Hope .

—Frank Morris.



THE LATE DR WM. BRODIE.

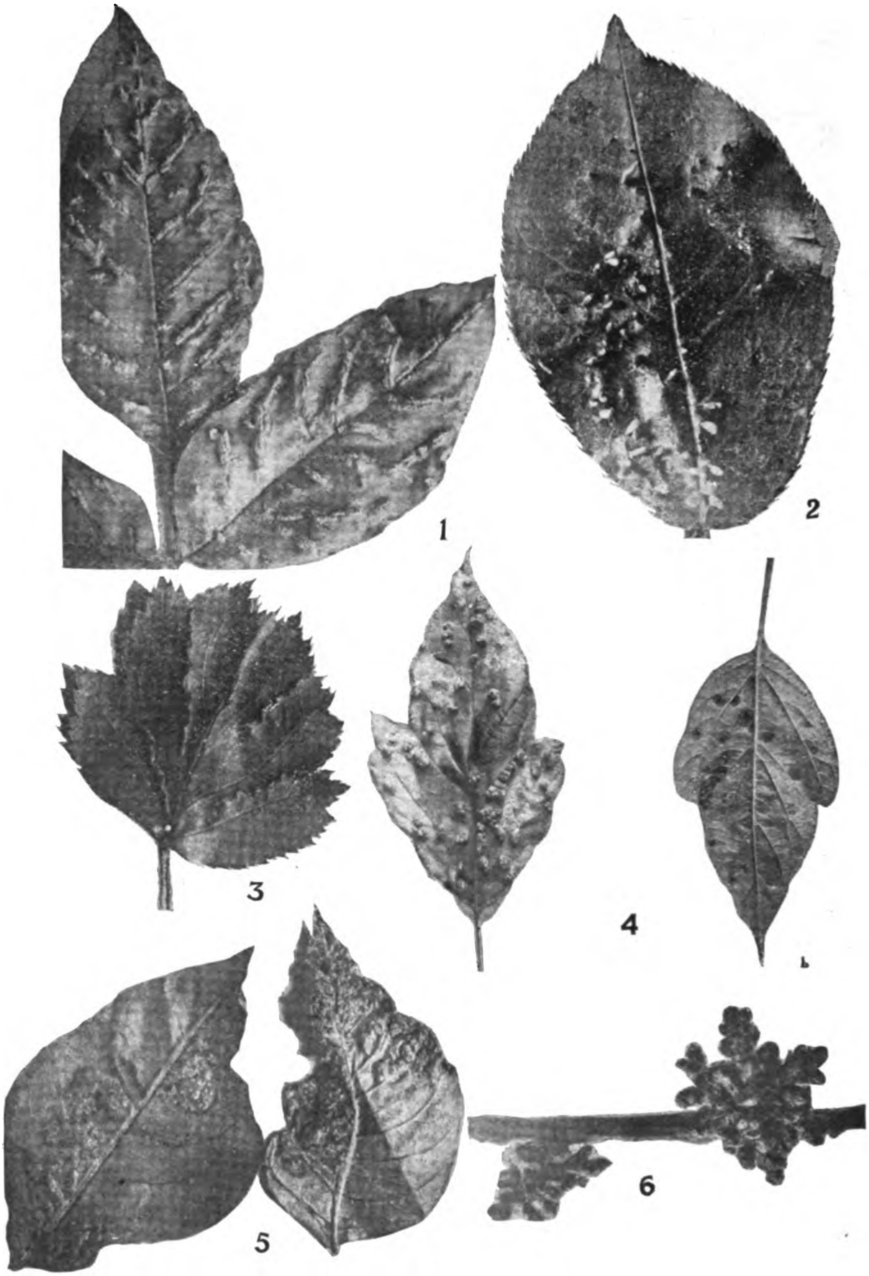
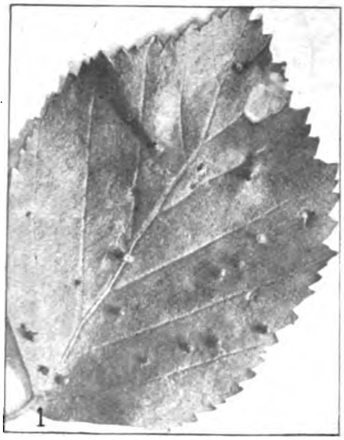


PLATE A.

1. Vein Gall on White Ash. *Eriophyes sp.*
2. Chokecherry Mite Gall. *Eriophyes sp.*
3. Hawthorn Serpentine Gall. *Eriophyes sp.*
4. Manitoba Maple Wart Gall. *Eriophyes sp.*
5. Poison Ivy Mite Gall. *Eriophyes sp.*
6. Birch Bud Gall. *Eriophyes sp.*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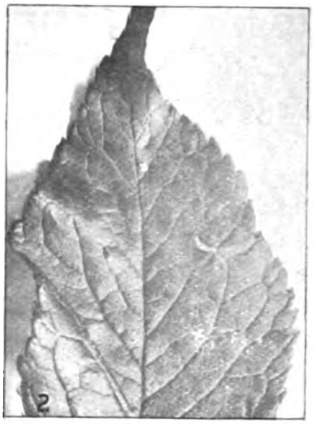
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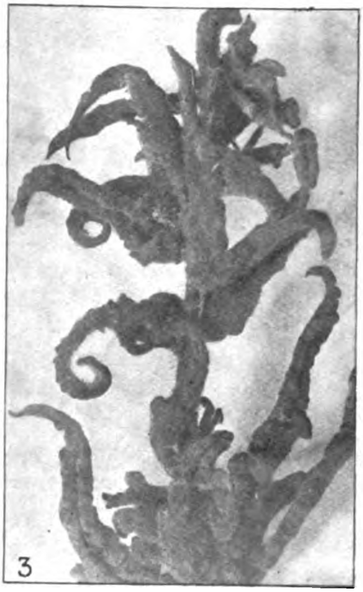
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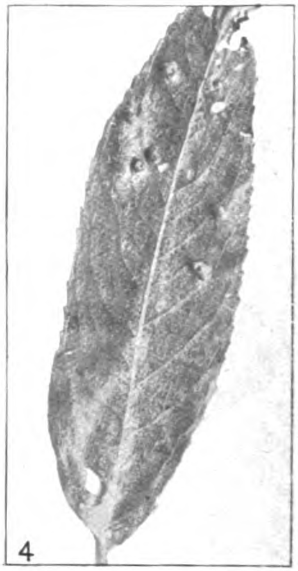
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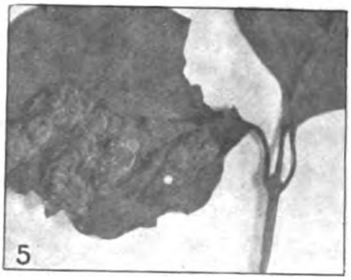
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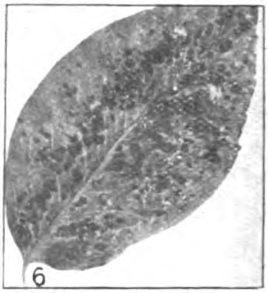
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PLATE B.

1. Eriophyes sp., Betula papyrifera.
2. Eriophyes sp., Prunus Americana.
3. Eriophyes sp., Rhus Cotinus.
4. Eriophyes sp., Salix discolor.
5. Eriophyes cephalanthæ, Cephalanthus occidentalis.
6. Eriophyes pyr' sp., Pyrus communis.

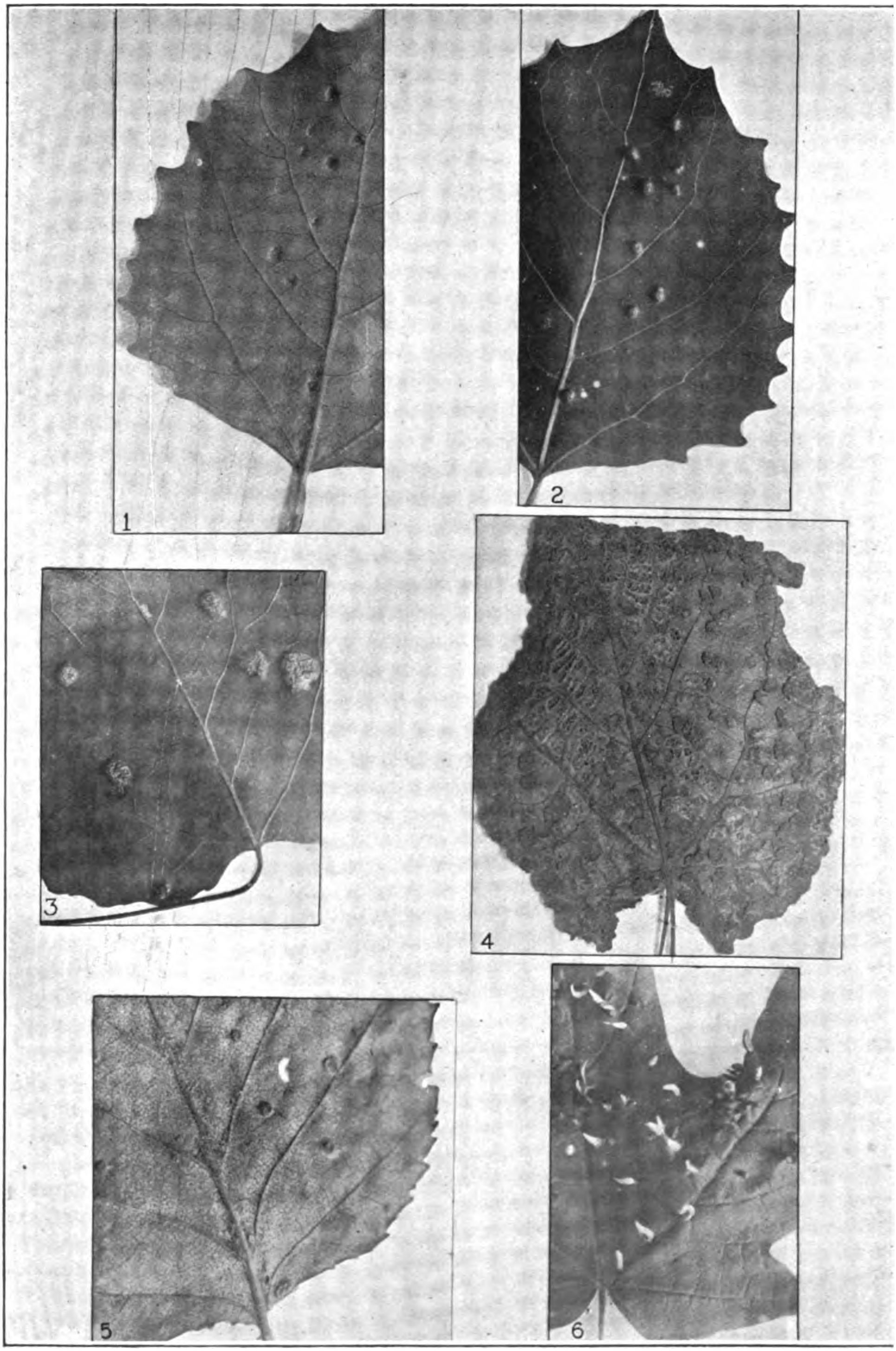
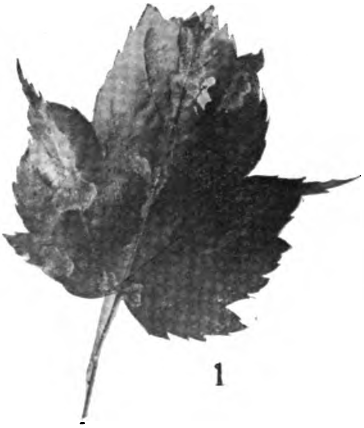


Plate C.

1. Eriophyes sp., (under surface) Populus grandidentata.
2. Eriophyes sp., (upper surface) Populus grandidentata.
3. Eriophyes sp., Populus tremuloides.
4. Eriophyes sp., Tilia Europea.
5. Eriophyes sp., Betula papyrifera.
6. Phlœcoptes aceris, Acer saccharinum.



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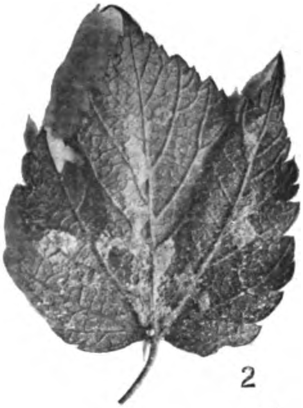

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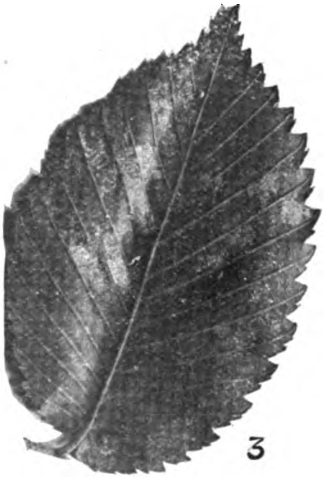

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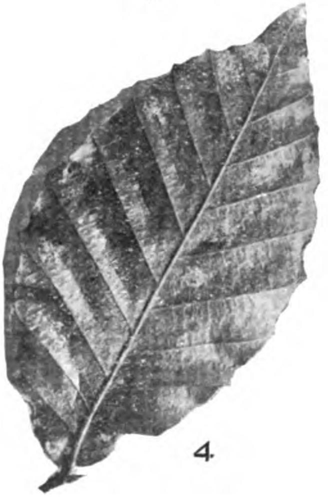

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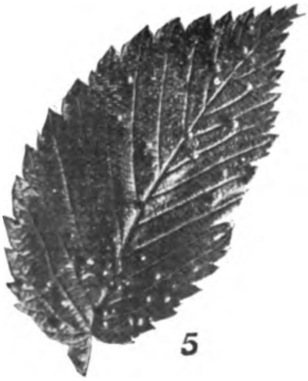

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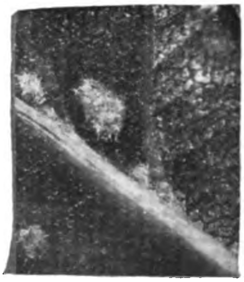

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PLATE D.

1. Sugar Maple Pink Frost Gall. ***Eriophyes sp.***
2. Manitoba Maple Frost Gall. ***Eriophyes sp.***
3. Rock Elm Frst Gall. ***Eriophyes sp.***
4. Beech Frost Gall. ***Eriophyes sp.***
5. Elm Mite Gall. ***Eriophyes ulmi.***
6. Elm Mite Gall. Enlarged opening on under surface.

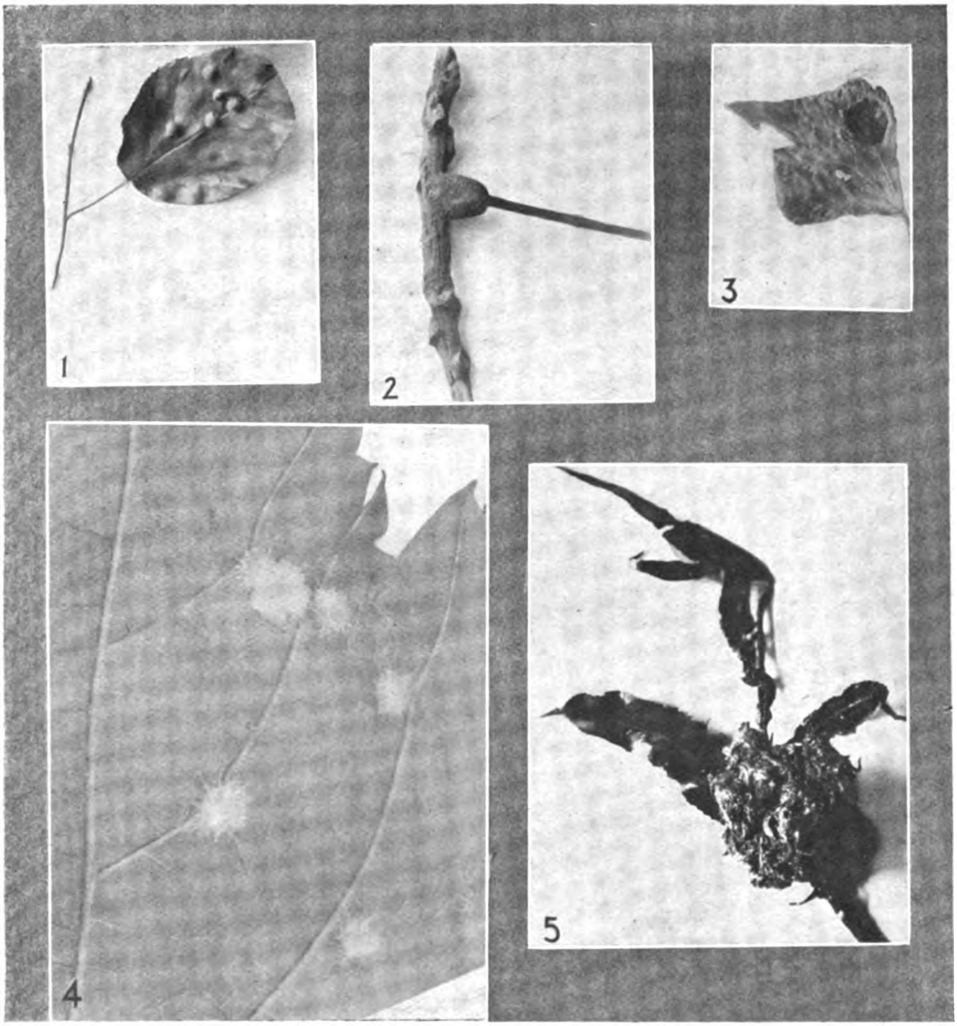

PLATE E.

1. Eriophyes sp., Amelanchier Canadensis.
2. Eriophyes sp., Juglans nigra.
3. Eriophyes sp., Populus italica.
4. Eriophyes sp., Vitis cordifolia.
5. Eriophyes sp., Salix fragilis.

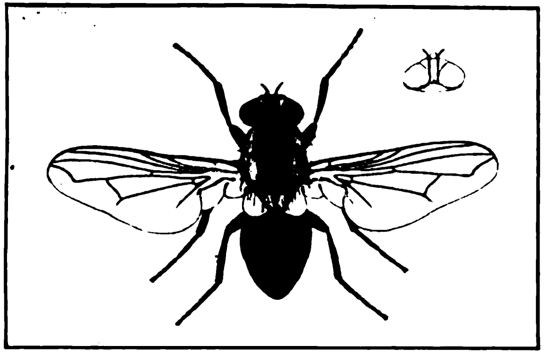

Fig. 1.—The House-Fly, ***Musca domestica*, L.**
Female.

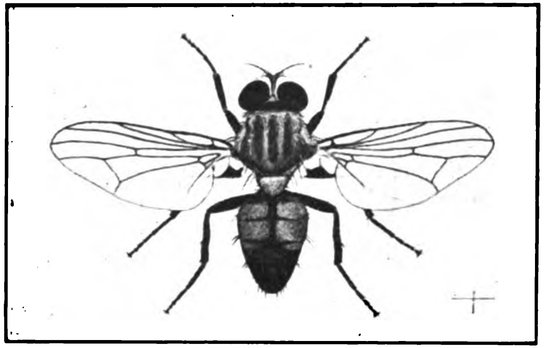

Fig. 2.—The Lesser or Small House-Fly,
***Homalomyia canicularis*, L. Male.**

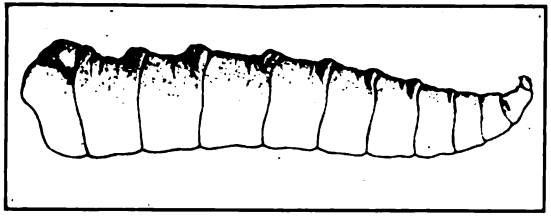

Fig. 3.—Full-grown Larva or "Maggot" of
***Musca domestica*.**

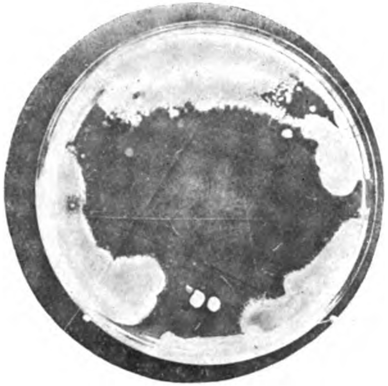

Fig. 4.—Colonies of Bacteria obtained by allowing a fly caught in the open to walk over a culture plate.

PLATE F. (See page 36.)

INDEX.

PAGE

Acarina as disease carriers 86
“ as parasites of animals.87, 94, 97
“ as parasites of insects, etc..89, 95
“ as pests of trees and crops. 91
“ as scavengers 90, 97
“ classification of 93
Acarina (mites) of Ontario 82
Adaptation in structure of insects... 76
Agrilus anxius 13
Alder, galls affecting 103
Anisota senatoria 65
“ virginiensis 73
Ants, conflicts between 51
Aphids (plant-lice)..12, 13, 14, 63, 68, 73
Apple aphids 12
“ galls affecting 108
“ leaf-hopper 10
Apples attacked by plum curculio..17, 68
Araneida, captures of 128
Ash, galls affecting 103

Back's Robber-flies of N. America.. 111
Bank's directions for collecting and preserving insects 111
Bark-beetles 16, 18, 58, 113
Basswood, galls affecting 103
Bat-flea 79
Beech, galls affecting 105
Beetle-mites 98
Beetles found on flowers 23
Bethune, C. J. S., article by 63
Beutenmuller's Holcaspis and their galls 111
Birch-borer, the Bronze 13
Birch, galls affecting 105
Bird-mites 100
Blackberry miner 18
Blaisdell's Revision of Eleodiini 111
Blister-beetles 11, 70
British Museum, Catalogue of Lepidoptera Phalænæ 111
Brodie, Dr. Wm., obituary notice of. 129
Browntail moth in Canada 19
Buttonbush, galls affecting 105

Cæsar, L., article by 16
Canker worms 13
Carrot rust-fly 73
Cassida viridis 82
Cerambycid beetles at flowers 25
Cheese mites 99
Cherry, galls affecting 108
Chestnut, galls affecting 105
Codling moth 12, 67
Coleoptera, captures of 121
Collecting and preserving specimens of Insects: Banks 111
Cosmopepla carnifex 15
Cottony maple scale 64
Criddle mixture for grasshoppers ..10, 66
Cucumber beetle, the striped 11
Currant aphis 12, 73
“ borer 73
“ worm (sawfly) 12

PAGE

Diabrotica vittata 11
Diptera, captures of 123
Dogwood, beetles frequenting 28

Eccoptogaster rugulosus 16, 58
Elder blossoms, beetles frequenting. 26
Eleodiini, monograph of: Blaisdell.. 111
Elm caterpillar, the spiny 13
Elm, galls affecting 13, 106
Elm-leaf aphis 13
Elmtree scale 14, 64
Empoasca mali 10
Ennomos subsignarius 56
Entomological errors, origin of 46
Entomological record 110
Epicauta Pennsylvanica 11
Epitrix cucumeris 11
Eriophyes (gall-mites) 101
Eulecanium nigrofasciatum 18

Fall webworm 14, 73
Field crops, insects injuring 10, 70
Flea beetles 11, 72
Forest and shade trees, insects attacking 13, 73
Fruit crops, insects affecting........ 12
Fruit-tree bark-beetle 62
Fyles, T. W., articles by 73, 76

Gall mites 83
Galls on elm-trees 106
Garden plants, insects affecting..14, 65, 72
Gibson, A., articles by 9, 19, 42, 54, 110
Gossyparia spuria 64
Grain aphis 10
Grape, galls affecting 106
Grasshoppers 10, 66,70

Hampson's Catalogue of British Museum Phalænæ 111
Harrisimemna trisignata 81
Harvest mites 96
Hawthorn bloom, beetles frequenting 27
Hawthorn, galls affecting 106
Hazel, galls affecting 106
Hemiptera, captures of 124
Hessian fly 10
Hewitt, C. G., articles by 20, 30
Holland's Moth Book, corrections of errors in 49
Hopkins: Monograph of Dendroctonus 112
Hoplia trifasciata 24
House flies and their allies 30

Insect Friends and Enemies: Smith 112
Itch mites on man andanimals 101

Jarvis, T. D., articles by 44, 82
Juneberry, gall affecting 107

Larch sawfly 13, 20
Lasius niger ant 51

PAGE
Lepidoptera, captures of 114
Literature, Entomological 111
Lochhead, W., article by 67
Locust, the Lesser Migratory 10
Lygus pratensis 14
Lyman, H. H., article by 46

Macrosiphum granaria 10
Mantispa brunnea 79
Maple, galls affecting 107
Maple, the spiked, beetles frequenting 28
Meromyza Americana 10
Mites, apparatus for collecting 84
Mites (see Acarina).
Morris, F. J. A., articles by 23, 129
Musca domestica 30, 141
Myrmica scabroides 51
Myzus ribis 12

Nash, C. W., article by 15
Nectarophora pisi 14
Nematus Erichsonii 13, 20
Neuroptera, captures of 127
New Jersey Tea, beetles frequenting 28
Nursery work in Ontario 21

Oak, caterpillars attacking 65, 73
Oak, galls affecting 107
Obituary: Dr. Wm. Brodie 129
Odonata, captures of 126
Orthoptera, captures of 125
Oyster-shell scale 68

Pea aphis, the destructive 14
Peach-tree bark beetle 60
Pear-tree slug 12
Phlœotribus liminaris 58
Plant-bug, the Tarnished 14
Plum curculio 17, 68
Plum-galls 13, 108
Poplar, galls affecting 107
Potato flea-beetle 11
Pteronus ribesii 12
Pulvinaria innumerabilis 62

PAGE
Red spider mite 14, 95
Robber-flies of N. America: Back ... 111
Root-maggots 11

Sanders, G. E., article by 51
San Jose scale 18, 22
Scale insects 18, 22, 62, 64
Scolioneura capitalis 18
Scolytids attacking pine 16
" Catalogue of N. American: Swaine 113
" Monograph of: Hopkins... 112
" Notes on fruit-tree 58
Scolytus rugulosus 16, 18, 58
Shot-hole borer 16, 18, 58
Smith's Insect Enemies and Friends 112
Snodgrass: The Thorax of Insects... 112
Sparganothes flavibasana 14
Spiders, captures of 128
Spiked maple, beetles frequenting... 28
Spruce, budovorm 13, 54
Sumac, galls affecting 108
Swaine's Catalogue of Scolytidæ.... 112
Swaine, J. M., article by 58

Tachinid flies 35
Tarnished plant-bug 14
Terrapin scale 18
Tortrix fumiferana 13, 54
Treherne, R. C., article by 21
Tussock moth 14, 16

Walnut, galls affecting 106
Water-bug, the Giant 78
Webworm, the Fall 73
Wheat-stem maggot 10
White grubs 65, 72
Williams, J. B., article by 14
Willow, galls affecting 108
Winn, A. F., article by 56
Wireworms 65, 71
Wood-boring beetles on flowers 25

Xyleborus dispar 58

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OF THE

Entomological Society

OF ONTARIO

1910

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TORONTO.

To the Honourable John Morison Gibson, K.C., LL.D., etc., etc., etc.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present herewith, for the consideration of your Honour, the Report of the Entomological Society of Ontario for 1910.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1911.

CONTENTS.

Page.
LETTER OF TRANSMISSION 5
OFFICERS FOR 1910-1911 9
CANADIAN MEMBERS 9
ANNUAL MEETING 11
  Reports on Insects of the Year: Division No. 1, ARTHUR GIBSON 11
    Division No. 5, F. J. A. MORRIS 16
    Division No. 2, C. E. GRANT 18
    Division No. 6, R. S. HAMILTON 18
    Division No. 3, J. B. WILLIAMS 19
    Division No. 7, R. C. TREHERNE 19
  Insects of the Year in Ontario: L. CAESAR 21
  The More Injurious Insects in Canada in 1910: C. GORDON HEWITT 27
  Notes on the Season of 1910: T. W. FYLES 30
  Report of the Council 32
  First International Congress of Entomology: H. H. LYMAN 32
  Report of the Montreal Branch 37
    " " Toronto Branch 38
    " " Librarian 39
    " " Curator 39
    " " Delegate to the Royal Society 40
  The Role of Insects in Water-life: J. G. NEEDHAM 42
  Exhibit of Specimens 43
  Beetles found about Foliage: F. J. A. MORRIS 45
  The Pool: T. W. FYLES 51
  The Bean Maggot in Ontario in 1910: J. E. HOWITT 56
  The Horse-radish Flea-beetle: A. F. WINN 59
  The Migration of some Native Locusts: NORMAN CRIDDLE 60
  On the Practical Importance of the Study of Parasitic Insects: C. GORDON HEWITT 62
  The Coccidae of Canada: T. D. JARVIS 64
  Aleyrodidae of Ontario: T. D. JARVIS 78
  Some Insects of the Larch: J. M. SWAINE 81
  Insect Notes from Ste. Anne's: J. M. SWAINE 88
  Basswood or Linden Insects, IV: ARTHUR GIBSON 99
  The Entomological Record, 1910: ARTHUR GIBSON 101
FINANCIAL STATEMENT 121
INDEX 122

FORTY-FIRST ANNUAL REPORT

OF THE

Entomological Society of Ontario

1910

To the Honourable James S. Duff, Minister of Agriculture.

SIR,—I have the honour to present herewith the Forty-first Annual Report of the Entomological Society of Ontario.

The Forty-seventh Annual Meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 3rd and 4th, 1910. The proceedings are given in full in the following pages, and include the reports of the various officers and branches of the Society, together with the addresses delivered and the audited financial statement of the Treasurer.

The "Canadian Entomologist," the Society's monthly journal, has been issued regularly during the past year, and has now completed its forty-second volume. It continues to maintain the wide circulation and high scientific value which have characterized it in the past.

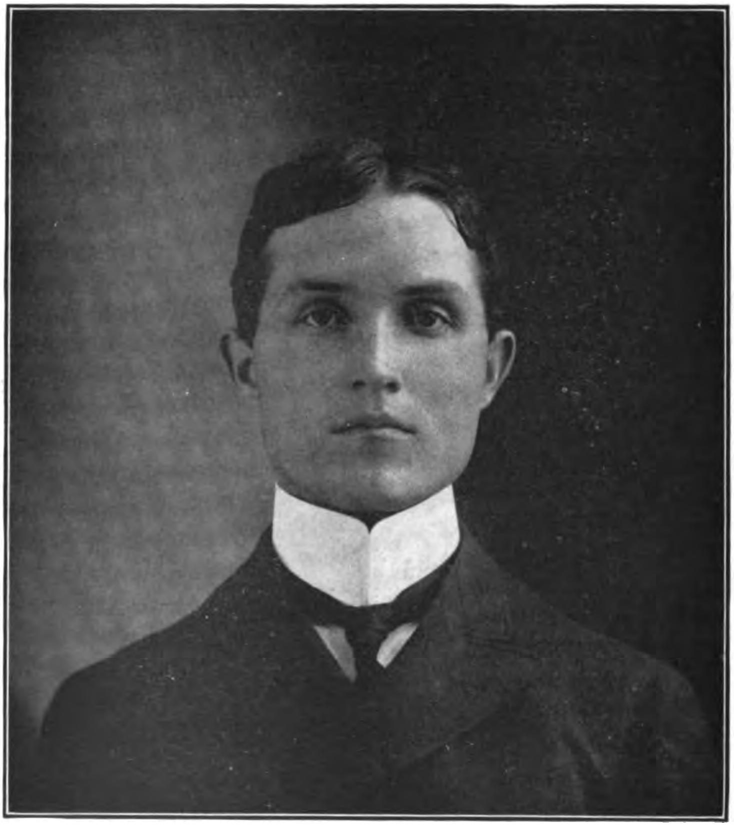
I have the honour to be, Sir,

Your obedient servant,

EDMUND M. WALKER,

Editor.

Biological Department,
University of Toronto.



Professor Tennyson D. Jarvis, B.S.A. (Ontario Agricultural College, Guelph). President of the Entomological Society of Ontario, 1908-1910.

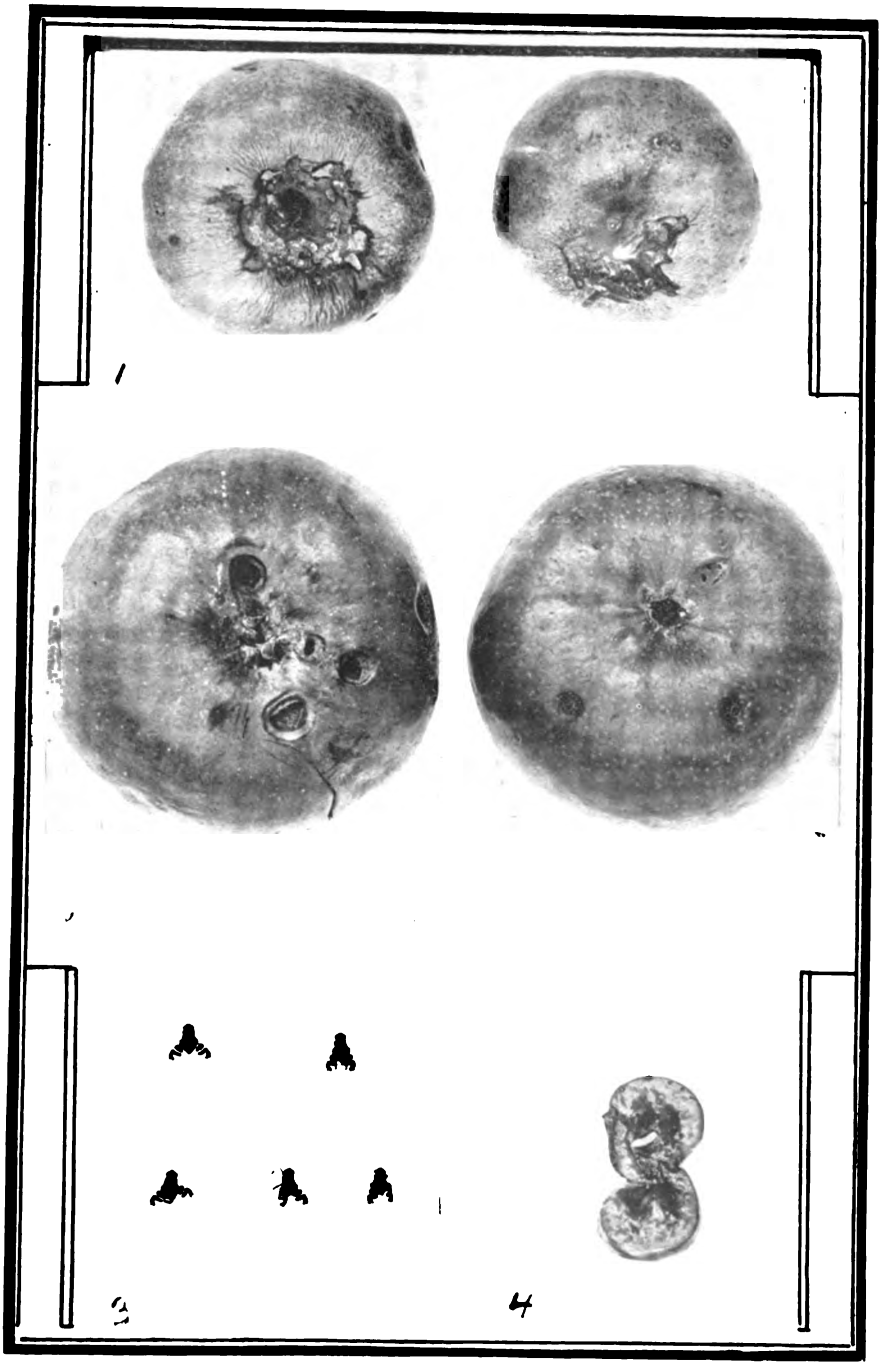


Plate A.—1. Work of Lesser Apple Worm. Note the large area injured. 2. Feeding punctures of Plum Curculio made by the new beetles in autumn. 3. Cherry Fruit Flies. (Natural size.) 4. Opened Cherry showing maggot about full-grown inside. (See pages 21 and 24.)

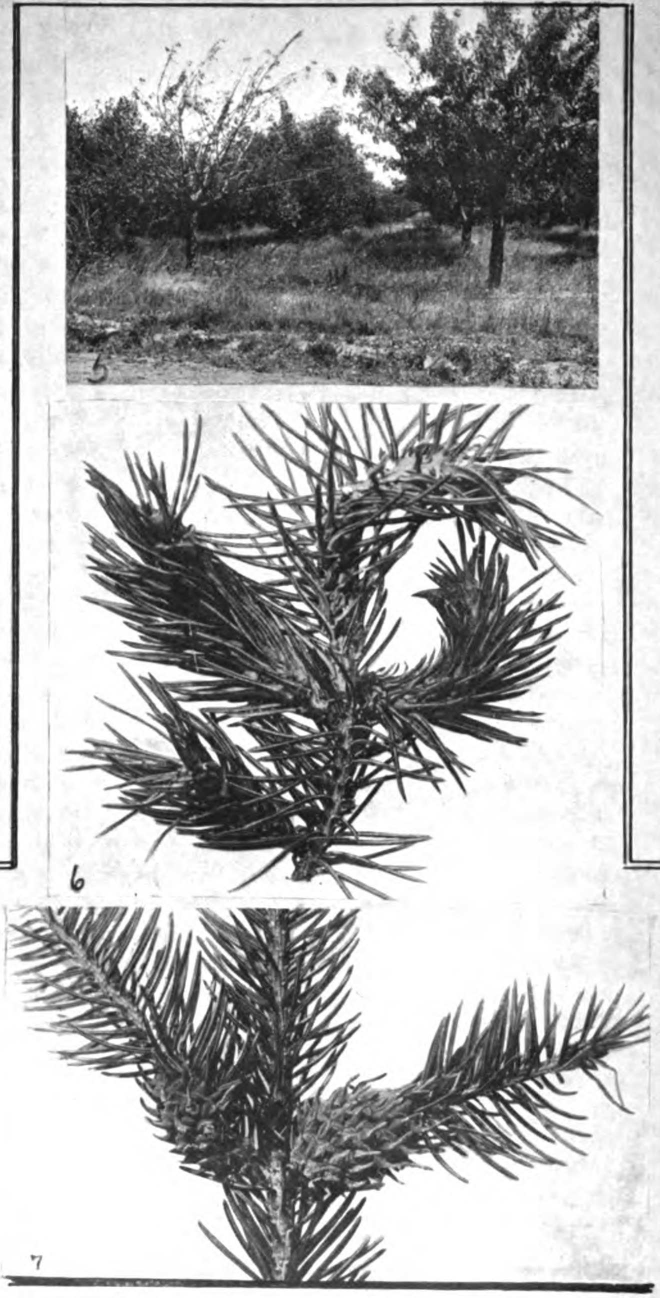


Plate B.—5. Sweet Cherry tree on the left almost completely defoliated by the Slug; tree on the right only slightly injured. 6. Galls on White Spruce caused by *Chermes similis*. 7. Galls on Norway Spruce caused by *Chermes abietis*.
(See pages 24 and 26.)

Entomological Society of Ontario.

OFFICERS FOR 1910-1911.

President—DR. EDMUND M. WALKER, Lecturer in Zoology, University of Toronto.

Vice-President—DR. C. GORDON HEWITT, Dominion Entomologist, Central Experimental Farm, Ottawa.

Secretary-Treasurer.—MR. J. EATON HOWITT, M.S.A., Lecturer in Botany, O. A. College, Guelph.

Curator—MR. LAWSON CAESAR, B.A., B.S.A., Lecturer in Entomology and Plant Diseases, O. A. College.

Librarian—REV. C. J. S. BETHUNE, M.A., D.C.L., F.R.S.C., Professor of Entomology and Zoology, O. A. College.

Directors—Division No. 1, MR. ARTHUR GIBSON, Dept. of Entomology, Central Experimental Farm, Ottawa; Division No. 2, MR. C. E. GRANT, Orillia; Division No. 3, MR. A. COSENS, Parkdale Collegiate Institute, Toronto; Division No. 4, MR. C. W. NASH, East Toronto; Division No. 5, MR. F. J. A. MORRIS, Trinity College School, Port Hope; Division No. 6, MR. R. S. HAMILTON, Collegiate Institute, Galt; Division No. 7, MR. R. C. TREHERNE, Grimsby.

Directors (Ex-Presidents of the Society).—PROFESSOR WM. SAUNDERS, C.M.G., LL.D., F.R.S.C., F.L.S., Director of the Experimental Farms of the Dominion of Canada, Ottawa; REV. C. J. S. BETHUNE, M.A., D.C.L., F.R.S.C., Guelph; W. HAGUE HARRINGTON, F.R.S.C., Ottawa; PROFESSOR JOHN DEARNESS, Vice-Principal Normal School, London; HENRY H. LYMAN, M.A., F.E.S., F.R.G.S., Montreal; REV. THOMAS W. FYLES, D.C.L., F.L.S., Hull, P.Q.; PROFESSOR WM. LOCHHEAD, B.A., M.S., Macdonald College, P.Q.; JOHN D. EVANS, C.E., Chief Engineer, Central Ontario Railway, Trenton; PROFESSOR TENNYSON D. JARVIS, B.S.A., Ontario Agricultural College, Guelph.

Editor of the "Canadian Entomologist"—DR. E. M. WALKER, Toronto.

Delegate to the Royal Society—PROFESSOR J. M. SWAINE, Macdonald College, P.Q.

Auditors—PROFESSORS S. B. MCCREADY and J. W. CROW, Ontario Agricultural College, Guelph.

LIST OF CANADIAN MEMBERS.

PROVINCE OF ONTARIO.

Abbott, Dr. A. R.	Toronto.
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Baker, A. C., O.A.C.	Guelph.
Baker, A. W., O.A.C.	"
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Bowman, J. H.	"
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Buchanan, Dr. G. C.	Beamsville.
Caesar, Lawson, O.A.C.	Guelph.
Calvert, J. F.	London.
Cosens, A.	Toronto.
Dearness, Prof. J.	London.
Dunlop, James	Woodstock.
Eastham, J. W., O.A.C.	Guelph.
Evans, J. D.	Trenton.
Gibson, Arthur	Ottawa.
Grant, C. E.	Orillia.
Groh, H.	Ottawa.
Gummer, A.	Toronto.
Hahn, Paul	"
Haight, D. H.	Sudbury.
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Hugh, W.	Englehart.
Inglis, John	Hamilton.
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Johnston, James	Hamilton.
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PROVINCE OF ONTARIO—*Continued.*

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Nash, C. W.	“
Pettit, Morley, O.A.C.	Guelph.
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Saunders, H. S.	Toronto.
Saunders, W. E.	London.
Silcox, Sidney	Stratford.
Smith, Arthur	Toronto.
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Walker, Dr. E. M.	Toronto.
Watson, Dr. A. H. R.	Port Hope.
White, James	Snelgrove.
Williams, J. B.	Toronto.
Wood, S. T.	“
Young, C. H.	Ottawa.
Zavitz, E. J., O.A.C.	Guelph.

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Boulton, A. R. M.	“
Brainerd, Dwight	Montreal.
Burgess, Dr. T. J. W.	Verdun.
Campbell, J. G.	Magog.
Chagnon, Gustave	Montreal.
Cutler, G. H.	Macdonald Coll.
Darling, H. M. E.	Montreal.
Delisle, A. M.	“
Denny, E.	“
Dunlop, G. C.	“
Fosberry, C. S.	“
Fyles, Mrs.	Hull.
Fyles, Rev. Dr. T. W.	“
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Huard, Rev. Victor	Quebec.
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Moore, G. A.	“
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Parkins, F., Jr.	“
Poston, Mrs. T. A.	Levis.
Rowland, A.	Windsor Mills.
Southee, G. R.	Outremont.
Swaine, J. M.	Macdonald Coll.
Symonds, Rev. Dr.	Montreal.
Tourchot, A. L.	St. Hyacinthe.
Weir, Douglas	Macdonald Coll.
Winn, A. F.	Montreal.

ALBERTA.

Carr, F. B.	High River.
Baird, Thos.	Edmonton.
Dod, F. H. Wolley	Millarville.

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Bryant, T.	Ladysmith.
Burns, Wm.	Vancouver.
Cockle, J. W.	Kaslo.
Croker, A. J.	Victoria.
Day, G. O.	Duncan's Station.
Draper, R.	Hillcrest.
Elliott, B. R.	Victoria.
Hadwen, Dr. S.	Vancouver.
Hanham, A. W.	Duncan's Station.
Harvey, R. V.	Victoria.
Keen, Rev. J. H.	Metlakatla.
Reed, E. Baynes	Victoria.
Ruham, Max	Vernon.
Russell, John	Hope Stn., C.P.R.
Scott, W. E.	Victoria.
Sherman, R. S.	Vancouver.
Skinner, E. M.	Duncan's Station.
Taylor, Rev. G. W.	Departure Bay, Nanaimo.
Venables, E. P.	Vernon.
Winslow, R. M.	Victoria.

MANITOBA.

Criddle, Norman	Aweme.
Heath, E. F.	Cartwright.
Hunter, Rev. A. J.	Teulon.
Wallis, J. B.	Winnipeg.

NOVA SCOTIA.

Chase, W., Jr.	Wolfville.
Hervey, C. L. G.	Round Hill.
Mackay, Dr. A. H.	Halifax.
Payne, H. G.	Granville Ferry.

SASKATCHEWAN.

Androchowicz, E.	Humboldt.
Willing, T. N.	Regina.
Neville, S. J.	Cottonwood.

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Cresson, Ezra T.	Philadelphia, Pa.
Howard, Dr. L. O.	Washington, D.C.
Scudder, Dr. S. H.	Cambridge, Mass.
Smith, Prof. J. B.	NewBrunswick,NJ
Uhler, P. R.	Baltimore, Md.
Webster, F. M.	Washington, D.C.
Wickham, Prof. H. F.	Iowa City, Iowa.

LIFE MEMBERS.

Saunders, Dr. William Director of the Experimental Farms of the Dominion.	Ottawa.
Bethune, Rev. C. J. S. Professor of Entomology, Ontario Agricultural College.	Guelph.

The Entomological Society of Ontario.

ANNUAL MEETING.

The forty-seventh annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 3rd and 4th. Professor Tennyson D. Jarvis, President of the Society, occupied the chair during the day meetings, and at the evening session the meeting was presided over by Mr. C. C. James, Deputy Minister of Agriculture for Ontario.

Amongst those present were Mr. H. H. Lyman, Montreal; Dr. C. G. Hewitt, Mr. Arthur Gibson and Mr. Groh, Central Experimental Farm, Ottawa; Prof. Swaine, Macdonald College, St. Anne's, P.Q.; Mr. John D. Evans and Miss Evans, Trenton; Mr. F. J. A. Morris, Trinity College School, Port Hope; Dr. E. M. Walker and Messrs. C. W. Nash, J. B. Williams and A. Gummer, Toronto; Prof. Needham, Cornell University, Ithaca, N.Y.; President Creelman, Professors C. A. Zavitz, W. H. Day, S. F. Edwards, E. J. Zavitz, C. J. S. Bethune, Messrs. J. E. Howitt, J. W. Eastham, L. Cæsar, D. H. Jones, Morley Pettit, of the staff; and a number of the students of the Ontario Agricultural College.

Letters expressing regret at their inability to attend were received from Dr. William Saunders, Director of the Dominion Experimental Farms, Ottawa; the Rev. Dr. Fyles, Hull, P.Q.; Prof. Wm. Lochhead, Macdonald College, P.Q.; Messrs. R. C. Treherne and G. E. Sanders, Central Experimental Farm, Ottawa; Messrs. A. F. Winn and G. Chagnon, Montreal; Dr. Watson, Port Hope; Mr. C. E. Grant, Orillia; Mr. A. Cosens and Miss Brodie, Toronto; Mr. R. S. Hamilton, Galt; and Prof. J. Dearness, London.

On Thursday morning a meeting of the Council was held, at which the report of the proceedings during the past year was drawn up, and several questions concerning the welfare of the Society were discussed. Amongst others was the consideration of a proposal to hold the next annual meeting at either Macdonald College, P.Q., or the Experimental Farm at Ottawa. This was referred to the Executive Committee for further action. Dr. Bethune was elected a Life Member, in recognition of his services to the Society since its inception 47 years ago.

In the afternoon the proceedings began with the reading of reports by the Directors on the insects observed in their respective districts during the past season. No report was furnished by Mr. C. W. Nash, Director for District No. 4, East Toronto.

REPORTS ON INSECTS OF THE YEAR.

Division No. 1, Ottawa District—Arthur Gibson, Central Experimental Farm, Ottawa.

Throughout the Ottawa district, injurious insects were remarkably abundant during the season of 1910. Most of the regularly-occurring pests were present in greater numbers than usual. The season, on the whole, was much drier than that of 1909, the rainfall being below the average; July and August were particularly dry.

ATTACKING FIELD CROPS.

The **HESSIAN FLY** (*Mayetiola destructor,* Say) was conspicuously present in wheat fields in the district. In 1909 no trace of it could be detected in fields where it did noticeable injury in 1908. During the past season large numbers of broken-down straws were seen in the middle of July, and all examined contained the well-known "flax seeds." In one plot on the Central Experimental Farm fully 10 per cent. of the plants were infested. The "flax seeds" were just above the first and second joints of the stems.

The **GREATER WHEAT-STEM MAGGOT** (*Meromyza americana,* Fitch) again attacked many of the varieties of wheat in the plots on the Central Experimental Farm, but as in 1909, the infestation was not serious. The so-called "silver-tops," or "dead heads," were easily detected in July. The larvæ were full grown about the middle of the month. The insect was present in larger numbers in the varieties of Durum and Emmer wheats.

CUTWORMS. The Red-backed Cutworm (*Paragrotis ochrogaster,* Gn.) and the Greasy Cutworm (*Agrotis ypsilon,* Rott.) were responsible for much damage throughout the Ottawa district. Rows of young beets were entirely destroyed, radishes were freely attacked, and young cabbages and cauliflowers were cut off soon after planting out. In larger fields many mangels were rendered useless. The cutworms were present in particularly large numbers in the first week of June.

WHITE GRUBS were reported as doing some injury, especially to potatoes. A friend of mine, living at Meach Lake, lost many of his potatoes from the work of these larvæ, which ate into them, making large holes and rendering them useless.

WIREWORMS were also destructive in the district. On one farm, a few miles from Ottawa, land which had been in sod for many years was used for growing celery. Just recently the owner of the place mentioned to me that his celery plants had been practically all destroyed by the wireworms.

Some injury by the **CLOVER ROOT-BORER** (*Hylastinus obscurus,* Marsh.) was observed on July 14th. At this time the larvæ were nearly full grown; at one place they had done a good deal of harm to Red Clover. The **GREEN CLOVER WEEVIL** (*Phytonomus nigrirostris,* Fab.) was also present in injurious numbers in the district. The work of the larvæ was very apparent towards the end of June. On 29th June some mature larvæ were collected; these spun their pretty little cocoons soon afterwards, and the beetles emerged on July 9th; at this date larvæ were still to be found.

The **TURNIP FLEA BEETLE** (*Phyllotreta vittata,* Fab.) was noticed to be very abundant on young turnips and radishes, particularly the former, on May 27th. These small, very active, shining black beetles are responsible for much damage, but they can be controlled by dusting the plants with Paris green and flour, or Paris green and land plaster, one pound of the former to 20 lbs. of the latter.

ROOT MAGGOTS. During the present year these very destructive insects have been extremely abundant in eastern Ontario. On the Central Experimental Farm the Radish or Cabbage Maggot destroyed radishes, cabbages and cauliflowers. Onions on the Farm were not attacked by the Onion Maggot, but in my own garden in the city about half of my onions were infested. The Corn-seed Maggot (*Phorbia fusciceps,* Zett.) did a good deal of injury to beans. In some fields examined towards the end of June, where pea beans had been planted, it was seen that the maggots first attacked the cotyledons, but as the plants grew and these were pushed up above the ground the maggots left them, and, in most plants examined, entered the stem, mostly near the roots. In some cases, however, the maggots had burrowed down through the stem from the cotyledons. The important injury caused by this maggot, of course, is in the destruction of the primary shoot. Some white beans, which were planted near these pea beans, were not injured by the maggot. An interesting result obtained in our rearing of these maggots this season was the discovery that root maggots were not altogether responsible for the damage done. From infested radishes we also obtained, in early July, large numbers of the larger fly, ***Muscina stabulans***, Fallen. A few specimens were also reared from pea beans. The food of ***Muscina stabulans*** is chiefly decaying vegetable matter, but it is known to attack growing vegetables. On the 14th October, mature larvæ and puparia of the Radish and Cabbage Maggot were found at the roots of cabbage plants.

ATTACKING FRUIT TREES.

The OYSTER-SHELL SCALE (*Lepidosaphes ulmi*, L.) is very prevalent throughout the district. Apple trees are especially attacked. This autumn large numbers of the fruit bear many of the characteristic scales.

The CHERRY and PEAR SLUG (*Eriocampa cerasi*, Peck.) has this year been again abundant around Ottawa. In September, many of the dull-coloured slimy larvæ were present on plum and cherry trees, as well as on mountain ash. This late brood seldom does serious damage. The foliage of some of the ornamental mountain ash trees on the Experimental Farm was conspicuously eaten, and when the skeletonized portions turned brownish the trees showed the attack very plainly.

The APPLE-LEAF HOPPER (*Empoasca mali*, LeB.) was fairly abundant in apple orchards, and although it apparently did not do any very noticeable injury, its work could be easily seen on the leaves late in the season.

The AMERICAN TENT CATERPILLAR (*Malacosoma americana*, Harr.) In spring and early summer many nests of this Tent Caterpillar were observed. The egg clusters were seen in the end of July to be very abundant, and for this reason we will most probably see next year a very much increased outbreak of the insect. Orchardists would do well to look for the nests of this caterpillar next spring, and as soon as they are noticed, cut them off and destroy them.

The EYE-SPOTTED BUD-MOTH (*Tmetocera ocellana*, Schiff.). This well-known apple pest was abundant in the district the past season, and did much injury in some orchards. At Ottawa this year the larvæ were noticed to be almost full-grown on July 9th.

Other such well-known pests of the apple as the CODLING MOTH (*Carpocapsa pomonella*, L.), the WOOLLY APHIS OF THE APPLE (*Schizoneura lanigera*, Hausm.), and the APPLE APHIS (*Aphis mali*, Fab.) were, as usual, present in injurious numbers.

ATTACKING FOREST AND SHADE TREES.

The FALL WEBWORM (*Hyphantria textor*, Harr.) was extremely numerous during the season. During my residence in Ottawa, since 1899, I have never seen so much injury by this well-known pest, as was done this year. Apple and wild cherry were the trees principally attacked; some of the smaller trees were entirely defoliated and rendered very unsightly by the many nests they bore. The work of this caterpillar was particularly noticeable in August. The Fall Webworm has been abundant this year all through eastern parts of Canada and the United States. In Maine, in the same month, I saw large numbers of the nests, dozens on a single tree. On July 6th I took from a raspberry bush near Ottawa a large nest, and by actual count it contained 318 larvæ. These varied in size from 1/8 of an inch to 1/2 an inch in length.

The SPRUCE BUD-WORM (*Tortrix fumiferana,* Clemens). In my report last year I mentioned an outbreak of this insect, which occurred particularly in the Upper Gatineau district, north of Ottawa. We had hoped that the outbreak of 1909 would not be repeated in 1910, but most unfortunately the insect was again present in enormous numbers during the past season, not only in the Upper Gatineau district, but throughout other areas in the Province of Quebec. In the immediate vicinity of Ottawa the larvæ could be found without difficulty on spruce trees, but they were not present near the city in numbers sufficient to do noticeable injury. At Ottawa, this year, many larvæ were mature in the first week in June, and specimens collected at that time produced the moths about two weeks later. On June 27 many empty chrysalides were seen on spruce trees on the grounds of the Central Experimental Farm. Female moths collected on July 16th deposited eggs on July 18, the larvæ hatching 7 days later. On July 23 thousands of the moths were present in store windows on Sparks Street.

The LARCH SAWFLY (*Nematus erichsonii,* Hartg.), is continuing its ravages all through the district. Many trees were seen which had been entirely defoliated. At Ottawa I found the clusters of the eggs on May 28 and at that time some of the young larvæ were just appearing.

Two other insects were very abundant on larches this year, viz., the LARCH CASE-BEARER (*Coleophora laricella,* Hbn.), and the WOOLLY LARCH APHID (*Chermes strobilobius,* Kalt.) The Larch Case-bearer made its first appearance at Ottawa, as recorded by the late Dr. Fletcher, in 1905. Since then it has not been abundant until the present year. The attack this year was very apparent early in May. The moths began to emerge towards the end of that month. On June 15, moths were seen in numbers around the trees. This autumn the larvæ are plentiful on the trees, in their small incomplete cases. On May 27, the larches on the Central Experimental Farm were abundantly infested with the Woolly Larch Aphid. Clusters of the brownish eggs were found at the fascicles of the leaves on this date, and the young woolly aphids were scattered all over the leaves, the white woolly secretion being very conspicuous. The young were small and had only recently hatched. From one egg mass brought into the Division, some young emerged May 31.

The WHITE-CEDAR TWIG BORER (*Argyresthia thuiella,* Pack.) is this year again present in numbers throughout the district. It is not, however, as numerous as it was in 1905 and 1906. The tiny green larvæ of this species bore inside of the young tips of white cedar, causing the same to die, which injury, of course, is conspicuous and gives the trees a sickly appearance. The partly grown larva passes the winter within the twig where it has been working.

The MAPLE PHENACOCCUS (*Phenacoccus acericola,* King). On many of the trunks and lower branches of maple trees along the streets of Ottawa there are, at the present time, small, but conspicuous deposits of a cotton-like waxy secretion beneath which are colonies of this insect. Towards the end of September adult females, which are light yellow in colour and about one-fifth of an inch long, were found and large numbers of eggs. These latter were noticed to be hatching on Oct. 13. The young larvæ, which winter on the trees, were, on hatching, white with a yellowish tinge on the dorsum. As yet the trees are not seriously infested but the insect has increased abundantly this year and, as it is capable of doing important injury, if this continues, the trees may, of course, require some treatment. This is the first record of the Maple Phenacoccus occurring in the Ottawa district.

An interesting outbreak of the small Curculionid beetle, *Orchestes rufipes,* Lec., occurred locally on willow toward the end of May and during the first half of June. The beetles were first noticed on a large laurel-leaved willow, (*Salix pentandra,* L.), on the Experimental Farm, on May 31; four days later the beetles were more plentiful and by the 15th of June they were quite numerous and their work very noticeable. While the beetles did not do any serious injury their habit of eating small, round holes into the epidermis on the underside of the leaves, destroyed, of course, the beauty of the foliage to a marked degree. In one leaf, which measured 2¼ inches long by 1 inch wide, at its widest part, I counted 329 of these little holes. When standing beneath a tree and looking up among the foliage the work of this insect is very conspicuous.

The BUTTERNUT TINGIS (*Corythuca arcuata,* Say.) At Chelsea, Que., Mr. Herbert Groh found a pretty little lace-bug in large numbers on butternut on June 20. The species answers to the description by Fitch of *C. arcuata* which appears in "Packard's Forest Insects." The species is known to occur also on birch, willow and other trees. The injury is done by the insects puncturing the leaves and sucking the juices.

The PINE BARK APHID (*Chermes pinicorticis,* Fitch.) This insect is abundant on some white pine trees at the present time near Ottawa. The trunk of one large tree recently under observation is much infested with the aphid, and the patches of the flocculent downy matter give the trunk a very white appearance not unlike snow. A Syrphid larva is present in numbers feeding upon the aphides.

PLANT LICE were extremely abundant on shade trees. The large green aphis on cut-leaved birches occurred in great numbers. In the middle of September the trees showed conspicuously the result of the attack. Manitoba maples were heavily infested with plant lice. The Elm Leaf Woolly Aphid was again injurious. The Snowball Aphis rendered unsightly the foliage of many beautiful Virburnums in gardens.

The FALL CANKERWORM (*Anisopteryx pometaria,* Harris) was noticed in numbers on basswood and other trees. At the end of May the work of the larvæ was very apparent.

The BIRCH LEAF SKELETONIZER (*Bucculatrix canadensisella,* Chamb.). The presence of this insect on cut-leaved birches was apparent in August and September; on September 16th some full-grown larvæ were seen. The small white pseudococoons, which are made by the larvæ as temporary shelters during the time they are moulting, were conspicuous on the leaves.

GREENHOUSE AND FLOWER GARDENS.

Of the greenhouse insects which were specially troublesome in the district, the following may be briefly mentioned:

The GREENHOUSE LEAF-TYER (*Phlyctænia ferrugalis,* Hbn.) occurred in large numbers in the houses of one of our local florists; roses were chiefly attacked. In the same house, last month, a small black Thrip was doing considerable injury to the buds of roses. The WHITE FLY is troublesome in some houses, attacking a large variety of plants; it was noticed to be working particularly on *Coleus* and *Primula.*

In flower gardens the worst insect of the year was the TARNISHED PLANT BUG (*Lygus pratensis,* L.). This insect does a tremendous amount of damage almost every year to all kinds of flowering plants. It takes a special delight in destroying the tender buds.

The FOUR-LINED LEAF BUG (*Pœcilocapsus lineatus*, Fab.) was found destroying dahlias in July; it attacked the leaves and buds. Many of these insects, as well as of the Tarnished Plant Bug, can be destroyed by spraying the infested plants with either kerosene emulsion or whale-oil soap. They can also be jarred from the plants into an inverted umbrella and then put into a receptacle containing coal oil and water.

The GRAPE-VINE LEAF-HOPPER (*Typhlocyba*) occurred abundantly the past season. Virginia creepers all through the city of Ottawa were severely infested, and before the middle of July much of the foliage had turned whitish in places, owing to the attack of the insect.

The DESTRUCTIVE PEA APHIS (*Nectarophora pisi*, Kalt.) was again present in the district, but was not particularly injurious. Small colonies were seen on field peas at the end of July, but later it was found in numbers on sweet peas in gardens. In my own garden, the parasite *Praon cerasaphis*, Fitch. did good service in reducing the numbers of the plant louse; the lady-bird beetles (*Hippodamia convergens*, Guer., *Adalia bipunctata*, L., and *Coccinella transversoguttata*, Fab.) were also present in fair numbers, feeding upon the aphis.

The CURLED ROSE WORM (*Emphytus cinctipes*, Nort.) was more than usually abundant, and infested roses could be seen in many gardens. The larvæ were particularly noticed in the middle of July, when they were about full-grown and when their work was easily detected. This is an extremely easy insect to control, and there is no reason why beautiful rose bushes should be rendered unsightly by the attacks of this false caterpillar. A weak Paris green mixture sprayed over the bushes will quickly destroy all the larvæ on the leaves.

HOUSEHOLD INSECTS.

All of the worst household insects were present in Ottawa during the year. COCKROACHES were complained of from many sources. The BUFFALO CARPET BEETLE was abundant in some houses, and caused a good deal of anxiety. Both of the two common CLOTHES MOTHS were especially numerous, and much havoc was wrought in houses where woollen clothing, furs, etc., had carelessly been left to hang in cupboards during the summer. A few weeks ago I saw a beautiful Persian lambskin coat, which had been practically destroyed by the larvæ of the SOUTHERN CLOTHES MOTH (*Tineola biselliella*, Hum.). Although called the Southern Clothes Moth, this insect, unfortunately for us, does not confine its work of destruction to localities to the south of us. The BLACK CARPET BEETLE (*Attagenus piceus*, Oliv.), during the winter of 1909-1910, was present in destructive numbers. In one instance, that came under my notice, these insects did serious injury. In two cupboards, the contents of which had not been examined for some months, damage was done to woollen goods, and also to a beaver collar of a fur-lined coat. Larvæ noticed in the early part of April were from 6 to 10 mm. in length.

DIVISION NO. 5, PORT HOPE DISTRICT—F. J. A. MORRIS, PORT HOPE.

Owing to prolonged absence I have had little opportunity of direct observations. At the end of September I interviewed a young farmer east of the town, whose orchards two or three seasons ago were badly infested with the Oyster-shell Bark-louse. He tells me that the pest has almost entirely disappeared in the neighbourhood; and this good result he believes is due to careful cleaning and spraying under advice from the Agricultural Department.

Mr. Hume, a well-known seedsman in Port Hope, who is a large grower of peas, informs me that a greenish black louse (presumably *Nectarophora destructor*) has been abundant this year, far more so than he has ever found it before; he thought that it was most prevalent just after damp spells in the hottest part of the season; this would be rather contrary to the habit of most plant lice which multiply in dry seasons. The insect had destroyed a great many of his pea-vines.

The larva of the SAW-FLY (*Selandria cerasi*) has been abundant in our neighbourhood this season, and has completely destroyed the foliage of some trees. Mr. Mitchell, of the Ontario Gardens, had some young pear trees stripped; a neighbour some cherry trees; and in one orchard the larva was found prevalent on plum trees, as well as cherry and pear. The damage in all cases was done by the later brood at the end of August and in September.

The larva of *Rhagoletis pomonella* (the APPLE MAGGOT) has been quite a severe pest in our neighbourhood, chiefly affecting the early apples; a great many of the apples that ripen in September were attacked by this fly, and the fruit fell to the ground spoiled. In the east section of Port Hope the apple-pickers complain of the damage done by the "Railroad Worm," or by some disease that turns the flesh of the apple to a woody consistency and causes the fruit to develop irregularly; on the outside the apple has a gnarled and deformed appearance. This does not appear to be caused by an insect, though one apple-picker assured me that "the railroad worm" was not a grub, but a name given to the green fibrous thread that sometimes showed in the flesh of the apple where it had turned woody. In some orchards the entire crop was ruined; in all the affected area the apples that were gathered were marked second grade. It was first noticed in Snow apples, but Talmon Sweets were also affected, and the worst sufferers were Spies.

The day after returning to Port Hope I examined a large field of asparagus north of the town, and found both species of asparagus beetle fairly abundant; it was three years ago that I first found *Crioceris 12-punctatus* so far east, and this season of 1910 is the first in which the other species (*C. asparagi*) has come under my notice. The spotted kind was more abundant than the more recent arrival in the neighbourhood. I examined two other asparagus beds, east and north-east of the town; in each case the two species were present. Larvæ as well as beetles were observed in the foliage as late as the 20th of September. They do not appear to do much harm to the full grown plant, and there was little sign of the spring brood having wrought havoc; the asparagus rows appeared well filled, as though few heads had been destroyed at the beginning of the season.

To turn from economics, some remarkable gatherings of butterflies were noticed this year; Mr. Mitchell, of the Ontario Gardens, saw great masses of a yellow butterfly along the road sides while driving through the country. This was doubtless one of the Clouded Yellows (*Colias philodice*). In August, too, were noticed in two or three parts near Port Hope, millions of the Milkweed Butterfly (*Anosia plexippus*). In one case a small beech wood was filled with swarms of this butterfly, so that the branches of the trees appeared as if covered with brown foliage; if a stick was thrown up, myriads of the insects rose into the air and settled down again.

In the order Coleoptera, nothing new was taken by myself, and Dr. Watson, my fellow-collector, noticed nothing much that was unusual in our collecting grounds, though few of our old friends about the blossoms and foliage failed to return to their haunts as usual. On June 26th were captured one or two specimens of *Acmæops proteus* settling on a pine trunk; and between that date and July 13th were taken some five or six specimens of *Neoclytus erythrocephalus* on the trunk of a felled oak. From the latter date till August 7 were found some specimens of *Leptostylus* resorting to a pile of oak billets at the same spot; they appeared to be about to oviposit between the bark and the wood at the ends of the billets, probably attracted by the smell of fermenting sap. Two species of *Oberea* were captured between June 26 and July 13, one feeding in dogwood blossom, the other resting on raspberry foliage. About raspberry foliage, too, as well as about basswood leaves there were more specimens of *Agrilus* than usual seen, mostly of two species, *ruficollis* and *anxius*.

Among Hymenoptera, the Horn-tails seem to have been active on the young elms bordering some of our residential streets; I found in October as many as three females of *Tremex columba* imprisoned in the bark of one young elm.

DIVISION NO. 2, ORILLIA DISTRICT—C. E. GRANT.

The season of 1910 was again, like 1909, very cold and late in spring, the warmest weather 73° in the shade occurred in March, in which month the temperature was over 70° on three different occasions (though we did not have much warm weather until near the middle of June), and several species of moths were taken by me at light in March, an unusual occurrence here.

Injurious insects were not remarkably plentiful. Complaints were made of the turnip-root maggot, in fact late sown turnips were almost a failure from the depredations of this insect. The RASPBERRY CANE-GIRDLER (*Oberea bimaculata*) was noticeably abundant; in some gardens the broken tops of the canes looked as if someone had been going through the patch with a stick. The apple crop was almost a failure here; I have reason to suppose that it was caused by the very wet weather which occurred during the time the trees were in blossom, and in consequence the bees had no chance to carry the pollen for fertilization. *Carpocapsa pomonella* should be rare next year if scarcity of food lessens their numbers.

CANKER WORMS were very common here this spring; the moth of these and of *Erannis tiliaria* are in great numbers around my lamp as I write this, October 25.

Nematus ribesii, the CURRANT WORM, was very prevalent, and the first brood coming in the wet season of this year made it almost impossible to keep any insecticide on the plants long enough to check their ravages.

On a hedge of hawthorn a species of Schizoneura was so plentiful that the trees appeared as if they had been whitewashed. On examination it closely resembled the alder louse, on which *Feniseca tarquinius* feeds.

During a wind storm in July a large quantity of maple trees, or large limbs of the same, were broken. This occurred particularly in two or three localities where the trees were full of the burrows of the PIGEON TREMEX (*Tremex columba*), and many of the grubs and even parts of the perfect insect were present; there seemed to be no other reason for their rotten appearance except what might be from heavy top pruning. I have taken some moths this season which are rare to me, viz., *Fentonia martesia*, *Elida caniplaga*, *Notodonta simplaria*, *Plusia oxygramma*, *Syneda Alleni*, etc.

DIVISION NO. 6, GALT DISTRICT—R. S. HAMILTON.

The weather conditions in this district during the past spring and summer have not been favourable for insect life, and as a consequence fruit growers, nurserymen and the farming community in general have had little to contend against in the way of insect pests.

It is rather remarkable that plant lice, which were responsible for considerable damage in the orchard and field in 1909, were scarcely in evidence this season. The same is true of the cutworms and the codling moth.

Slight exceptions to the general freedom from insect pests were the Colorado potato beetles, which were unusually abundant. Some complaint was also made of the ravages of the CANKERWORM (*Paleacrita vernata*), which did some injury to the beech, maple and apple trees. Maple trees in Galt and vicinity have been attacked by the PIGEON TREMEX (*Tremex columba*), but investigation showed that no very serious injury has been done.

DIVISION NO. 3, TORONTO DISTRICT—J. B. WILLIAMS, TORONTO.

I have been away in England most of the summer; so that the only matter on which I can report anything is the well-worn subject of the TUSSOCK MOTH.

These insects have been very numerous in Toronto during the past summer, and I have noticed quite a large number of trees that have been seriously damaged by them, nothing being left on large portions of the foliage, except the veins of the leaves.

Our Park Commissioner obtained, this autumn, a grant of $3,500 for the purpose of collecting the egg masses of the cocoons; and, I believe, he is employing three gangs of men in this work as long as the fund lasts; but the egg masses must be more generally collected in the private grounds and gardens of the city if the work is to be really successful.

Great numbers of the cocoons this year were found on two apple trees in the garden of the house where I live, though there were no signs that the caterpillars had been feeding on the leaves of these trees. I picked a large handful of the egg masses off them a few days ago; and so did a little towards the destruction of this troublesome pest.

DIVISION NO. 7, NIAGARA DISTRICT—R. C. TREHERNE.

I have the honour to present my first report as representative for the Niagara District.

I regret to say that my report must be lacking in detail, for the reason that I have been absent from the district for a greater part of the summer, consequently I am compiling this report with the assistance of friends residing in the district and from a few notes I had in hand previous to leaving the district.

The fruit-growers of the Niagara district are still greatly troubled by several very serious insect pests. There are four insects which are present every year, and which, I regretfully have to believe, are yearly increasing over a larger area. These four are—

1. The CODLING MOTH (*Carpocapsa pomonella*).
2. The PLUM CURCULIO (*Conotrachelus nenuphar*).
3. The SAN JOSE SCALE (*Aspidiotus perniciosus*).
4. SHOT HOLE BORER (*Scolytus rugulosus*).

In none of these cases am I able to give figures or statistics, showing effects of spraying or degrees of infestation. I can merely mention them as being the most serious pests with which the fruit-grower has to contend.

The CODLING MOTH has been more than ever abundant this year, especially so in unsprayed orchards. Even in cases where orchards have been sprayed at the correct time and with the right mixtures two or three times during the summer, the results have been disappointing. In orchards where the trees are attended to several years in succession satisfying results with sprays have been obtained, thus demonstrating that combined and continued attack on this insect results in success.

The PLUM CURCULIO during this last summer has been more plentiful than usual, at least not perhaps in point of numbers, but in comparison with the fruit crop, which has been light. The early spring and blossoming period was cold and wet, and it was hoped that these climatic conditions, while reducing the fruit yield, would also affect the numbers of this insect. Later reports show, however, that it was as much in evidence as usual, if anything, attacking a larger proportion of the fruit crop.

This insect attacks a variety of fruits, and the members of the Entomological Society should be urged to regard this insect with more attention. More observations are needed on the best time to spray. It is considered best to use an insoluble poison in a spray and to coat the leaves and the small developing fruits with it. But whether to spray early or late is the point to be determined. If spray is applied too early the calyx cup protects the young plum and when, in course of a few days, the calyx cup drops off, the plum is left clean and free for attack.

The SAN JOSÉ SCALE is steadily increasing, despite the greater number of men who are spraying, and if my information is correct, spreading to new orchards. I saw an excellent result of a spraying with lime sulphur (commercial) on a tree well encrusted.

The SHOT HOLE BORER is well on the level with the above insects in the matter of destructibility. We have no definite practical means of fighting it, and its attack usually means death to the tree. Such injury cannot be said of the other insects which we can fight with a more reasonable hope of success. The destruction of worthless trees and the cleaning up of lumber piles and fence corners cannot be too strongly advised.

There are other insects which have been more or less plentiful this year. The PEAR TREE SLUG (*Eriocampa cerasi*) has been particularly abundant on young cherry trees throughout the entire district. The CURRANT APHIS (*Myzus ribis*), an insect causing currant leaves to discolour and fall prematurely, has been commonly seen. The SNOWY TREE CRICKET (*Œcanthus niveus*) has been more abundant than usual attacking in particular the raspberry. The GRAPE BERRY WORM is reported from St. Catharines vineyards. Aphids common to the apple, which were reported in numbers last year, were present in considerably reduced numbers this year. The WOOLLY APHIS (*Schizoneura lanigera*), considered to be one of the worst pests of the apple in more temperate climes, is fortunately by no means abundant in the Niagara District. It is present, however, throughout the entire district, making itself shown in pruning scars and cracks and crevices of the bark. Its numbers are very small, but perhaps 25 per cent. of the apple trees of the district harbour, to a greater or lesser extent, a few of these insects. My observations, in this regard, only extend over comparatively few orchards.

One other insect might be mentioned as causing considerable annoyance to certain fruit-growers who were planting out sweet cherry trees this spring. It is a species of wood-boring wasp, the name of which has not yet been determined. This spring, on my own farm, I had occasion to set out upwards of 500 sweet cherries of various varieties. After they had taken a fair hold of the ground I pruned them, leaving merely a straight stem standing. The central portion of the stem is soft and pithy, and it is not for several weeks after pruning that the exposed surface hardens. One day, going over these trees, I noticed small, round holes bored down the soft, central pith and some castings of wood on the leaves below. Over 300 of my 500 trees were attacked in this way, the holes extending down the stem upwards of three inches. Stored snugly and tightly in some of these holes were numerous aphids. The cause of this injury was, apparently, one of the wood-boring wasps. Adults were captured and taken to Ottawa for identification.*

I heard of two other cases, within a radius of three miles of Grimsby, in which young cherry trees were attacked, and while the injury was not serious, it was distinctly annoying to have to rehead your trees. I punched out the aphids and filled the holes with a lime and lead arsenate paste as remedies.

I have to thank Messrs. Tennyson D. Jarvis and Wilfred Ryan for their assistance in this report, and also Dr. C. Gordon Hewitt, Dominion Entomologist, who has kindly allowed me to incorporate a few notes, which were obtained under his authority.

Insects of the Year in Ontario—Lawson Caesar, B.A.; B.S.A., Ontario Agricultural College, Guelph.

Orchard Insects—Codling Moth (*Carpocapsa pomonella*). The apple crop was very light this year and, as usually happens in such cases, a large percentage of the fruit was wormy. Many would place the amount of damage in unsprayed orchards at 50 per cent. of the total crop; it will probably be safe to estimate it at at least 40 per cent. Much more spraying than usual was done and fruit-growers are gradually learning that to get the best results they must do the work not only at the right time, but also very thoroughly. In every case very satisfactory results have followed good work; in fact it is a long time since the benefits of spraying were so clearly demonstrated. This is partly because the season was so favourable to the development of Apple Scab that only in sprayed orchards in many districts could any clean fruit be purchased.

Lesser Apple Worm (*Enarmonia prunivora*), Plate A, Fig. 1. While probably not more than 2 to 5 per cent. of the wormy apples of the Province could be attributed to attacks of the Lesser Apple Worm, individual orchards were discovered where the percentage was much higher. For instance, in one orchard near Guelph, fruit on the ground in October showed that 38 injuries out of a total of 80 had been caused by this insect; the rest were due to Codling Moth. Fruit purchased on the market from farmers in the vicinity of Guelph showed a considerable number of Lesser Apple Worm injuries. It is easy to find the larvæ in haws in this district up to almost the end of October. Specimens for class study each year are obtained from this source. The same spray as for Codling Moth seems to control this pest fairly well. It is just probable, however, that an additional spray with arsenate of lead about the first week in August would help greatly.

Plum Curculio (*Conotrachelus nenuphar*), Plate A, Fig. 2 (p. 7). Observations the last two years in various parts of the Province show that the damage to apples from the fall feeding of the new adults is very great in many districts. Wherever orchards are neglected or are situated near good hiding-places for winter quarters, such as woods, a large percentage of the apples, especially of the rougher skinned varieties, are rendered unsaleable by feeding punctures made from about the middle of August up into October. Thorough cultivation of the soil and the removal of rubbish of every kind has been observed in many cases to be quite as important as spraying in controlling this pest.

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* This insect, through the kindness of Dr. L. O. Howard, of the Bureau of Entomology, Washington, has been determined by Mr. S. A. Rohwer as *Cemonus inornatus* Say.

Mr. Gibson: What is the largest hole you found?

Mr. Caesar: There are often several small holes close together which may be worked into one large hole. The injured area is usually from 1/8 to 1/4 of an inch in diameter, and quite circular.

Dr. Hewitt: We have had a number of cases of where the holes are large. In some cases I think wasps have been responsible for the enlargement.

Apple Maggot or Railroad Worm (*Rhagoletis pomonella*). It has usually been supposed that this insect was found only in Prince Edward County and in a few orchards not far away on the mainland. In reality it is much more extensively distributed than has been suspected, and can probably be found here and there throughout most of the Province, though there are many orchards quite free from it. Infested apples have either been sent in from the following counties, or have personally been observed by the writer in them: Prince Edward, Hastings, Northumberland, Durham, Ontario and Lincoln. The insect seems to be worse on trees in villages or towns, wherever there is good shelter. In such places it has been seen to be very severe on Spy, Snow, Alexander and Tolman Sweet varieties, almost every apple being so badly attacked as to be much deformed and useless. Adults did not appear until July 15th this year east of Toronto. Methods of control in co-operation with the fruit-growers are being planned for the coming season. At present the prompt destruction of fallen fruit from August 1st to the end of the season is the remedy commonly advocated.

Mr. Nash: We have found as yet that the only method of control is absolutely rigid destruction of the fallen fruit.

Mr. Caesar: Has it been proven that the larvæ never emerge from the fruit before it falls?

Mr. Swaine: The evidence points that way.

Mr. Caesar: Have all the maggots come out after the apples have fallen in your tests?

Mr. Swaine: I do not think any come out till then. Sometimes the maggots are very small, but I have always had the impression that they did not come out until a short time after the apples drop, but I am not certain about it.

Mr. Caesar: I have seen a number of cases this year that seem to me to make that doubtful.

Mr. Jarvis: Have you made sure it was the Apple Maggot in the Niagara district?

Mr. Caesar: The external injury and the appearance of the larva itself corresponded so exactly with the genuine thing that I have no doubt that it was the Apple Maggot I found in that district.

Dr. Hewitt: The way to breed them is to get apples that have just fallen and put them in a box containing soil, and allow the maggots to come out.

Mr. Caesar: I saw, I suppose, one hundred in Michigan that had changed to pupæ even without any soil. They came out of apples that had been placed in a vessel for another purpose. This merely shows how readily they change to the pupal stage.

Mr. Howitt: Do the apples always fall when attacked?

Mr. Caesar: They often remain on the trees until quite late. Some Tolman Sweets that are attacked might be still found on the trees, but as a rule they fall earlier than they otherwise would.

Dr. Hewitt: They ripen prematurely.

Mr. Caesar: I have seen some orchards where Spies nearly all fell two or three weeks prematurely.

Dr. Hewitt: I could give you a practical illustration in regard to control by destruction of the fruit. One of the most serious places for the Apple Maggot has been in the orchards around Como, in Quebec, and Mr. Shepherd told me that he had cleared them out of his own orchard by destroying the fallen fruit.

Mr. Swaine: That case is the standard one quoted for the Apple Maggot all over the northern part of Eastern United States.

Mr. Caesar: I was aware of Mr. Shepherd's experience, and was much interested in it.

Mr. Swaine: He was particularly careful in his work.

Aphids of the Orchard.

These insects were not nearly so abundant this year as last, and only in a few cases were there any complaints of damage. Our most common species of green apple aphis is evidently *Aphis avenæ*, Fab. In a few orchards specimens of a rosy aphis, probably *Aphis pyri*, Boyer, were seen. On the sweet cherry the Black Aphis (*Myzus cerasi*, Fab.) was fairly abundant in the early part of the season, and caused considerable loss.

The Woolly Aphis (*Schizoneura lanigera*) was rather more abundant than usual. So far as I know this pest does not attack the roots to any appreciable extent. On the branches it can easily be destroyed by a spray of kerosene emulsion forcibly applied.

Mr. Caesar: Have you got the Rosy Apple Aphis at Montreal, Mr. Swaine?

Mr. Swaine: It is fairly abundant this fall.

Dr. Hewitt: *Aphis sorbi* is quite abundant in the West.

Mr. Caesar: What is your common green aphis on the apple?

Mr. Swaine: *Aphis pomi* (DeGeer).

Oyster-shell Scale (*Lepidosaphes ulmi*). This pest is rapidly being brought into subjection in all the best apple districts by the use of the lime-sulphur wash. This spray is rapidly displacing all others for this purpose, and wherever it is continued year after year it completely frees the orchard from the scale.

San José Scale (*Aspidiotus perniciosus*). Though specimens of San José Scale have been sent in this year from Northumberland County and last year from Prince Edward County, it is still doubtful whether it is capable of establishing itself firmly in these colder districts. Lime-sulphur is the standard remedy.

Blister Mite (*Eriophyes pyri*). This mite is now to be found in almost every district in the Province, although many orchards here and there are still exempt. It may prove a blessing in disguise, as it will in many cases force the farmer to spray his trees rather than let them look so unsightly and be so greatly injured. Lime-sulphur applied just as the buds are bursting has given very satisfactory results both last year and this.

Mr. Jarvis: Do you think it has spread so rapidly, or are people just opening their eyes and noticing it?

Mr. Caesar: In my brother's orchard there were only two pear trees, on which this had evidently been brought in. Those two trees two years ago were completely infested. To-day almost every tree in the whole orchard is attacked.

Mr. Jarvis: Five or six years ago I found it nearly everywhere in the Province.

Mr. Caesar: The fruit-growers tell me that in orchards where they are not spraying with lime-sulphur it has been spreading very rapidly. It certainly is all over the Province, though not in every orchard, by any means, but in every district.

Mr. Gibson: Dr. Fletcher used to say that where you can find a pear tree you will find a Blister Mite all over Canada.

Mr. Caesar: It is probably found now more on the apple than on the pear.

Anametis Grisea. Specimens of this Snout Beetle and of apple leaves injured by it were sent this year from Albury, Prince Edward County, and Grafton, Northumberland County. In the latter place it was suspected also of feeding on the bark of apple twigs. The beetles are nocturnal in their habits, so far as could be learned. In the day time they hide under loose bark on the tree. Specimens of injured leaves obtained at Albury, early in July, showed that they fed around the margin, causing it to become very jagged.

Pear Psylla (*Psylla pyricola*). It is several years since this tiny pest has been so abundant in the Niagara district as this year. In many cases the spring application of lime-sulphur should have been supplemented by the use of kerosene emulsion soon after the leaves had opened.

Pear and Cherry Slug (*Eriocampoides limacina*), Plate B, Fig. 5. Neglect to control this pest has led to its becoming exceedingly abundant the last two years. Many otherwise good cherry orchards have been rendered unsightly by the feeding of the slugs on the leaves. Young trees are most subject to attack, and are usually the ones most likely to be overlooked until the damage has been done. Plum trees were attacked in some places, as well as sweet and sour cherries and pears. Arsenate of lead readily controls the insect.

Cherry Fruit Fly (*Rhagoletis cingulata*), Plate A, Figs. 3 and 4. When the sour cherries were ripening I paid a visit to an orchard near Homer village, where it was said some grub, evidently not that of the Plum Curculio, was to be found in the cherries. As was suspected, the culprit proved to be the Cherry Fruit Fly. Many adults, chiefly males, were seen on the leaves and fruit, and not a few of them were captured with comparative ease. On examining the ripe fruit, maggots, very like those of the Railroad Worm, were found inside, some of them nearly or quite full grown. A few wormy cherries were brought back and put in a breeding cage. On examination of the soil in the autumn eight puparia were found about one inch below the surface. No experiments on control have been tried yet, but evidently care should be taken to gather all the fruit, so that none of it may fall to the ground and give the larvæ a chance to escape into the soil. All wild cherry trees in the neighbourhood should be cut down and burned, as these doubtless serve as breeding quarters. Discing the orchard and allowing chickens to run in it should be very helpful. Prof. Pettit, of Michigan, tells me that in that State the pest seems to disappear almost entirely from time to time. This is encouraging news, if it be true of Ontario as well as of Michigan.

Mr. Caesar: Does anyone know of any other district where this pest occurs?

Mr. Swaine: I have not heard of it down our way.

Mr. Howitt: It is in New York State, especially on cherries which have gone wild on the roadsides.

Fruit Bark-beetles (*Eccoptogaster rugulosus* and *Phleotribus liminaris*). These troublesome little beetles are not nearly so abundant as they were a few years ago. This apparently is to be attributed chiefly to the numerous parasites which are found to be attacking them. There are clearly two broods of *E. rugulosus*, the adults of the first appearing about the middle of June, and of the later brood about the middle of August. This species is much more common than *P. liminaris*.

Mr. Jones has discovered that *E. rugulosus* is frequently the cause of the spread of the Pear-Blight germs (*Bacillus amylovorus*). The best means of control is clearly the destruction by fire of all dead and dying branches, and of all old brush heaps early in spring. If any trees are seen to be attacked during July they should be burned shortly before the end of the first week in August, to destroy the larvæ and pupæ. After this date it is better to leave dying or attacked trees in the orchard to act as traps and entice the beetles from healthy trees. Those thus left should, of course, be destroyed next spring early.

The BLACKBERRY LEAF-MINER (*Metallus* (*Scolioneura*) *rubi*). This saw-fly larva has spread over most of the Province, and in some districts has done much damage to blackberries by mining in the leaves; sometimes almost every leaf is severely attacked by one or more larvæ. This year the adults appeared in the Niagara district by about July 1st, and egg-laying at once began, the eggs being placed, so far as I could observe, just under the epidermis, and not being visible externally. When full grown the larvæ enter the earth. There are almost certainly two broods each year, living larvæ of the last being found in the leaves as late as November 16th last year. The winter is passed in the larval (not pupal) stage in tiny oval earthen cases, about one inch below the surface of the ground. (Apparently this point has not been observed before.) These earthen cases are not held together with silk, but with some mucilaginous substance. Sometimes they seem to be hard to break open, and sometimes easy. Kerosene emulsion was tested on the leaves, but was clearly useless, as it could not penetrate through the epidermis, even though this was dead. The only remedy that seems practicable where the pest is severe is to stir the soil frequently with a hoe around the base of the plants very late in autumn and in spring up to July, so as to break the cases and destroy the larvæ or pupæ inside. If there are only a few leaves attacked these can be either pulled off towards the end of July or the larvæ crushed inside with the fingers, using a leather glove to protect against the thorns.

RASPBERRY SAWFLY (*Monophadnoides rubi*). The larvæ of this sawfly were more abundant than usual. Arsenate of lead should easily control them.

WIREWORMS AND WHITE GRUBS. The cold, late spring retarding the growth of grain after it came through the ground seemed to give Wireworms and White Grubs a chance to do much more damage than usual. During the farmers' excursions in June I was almost constantly being asked for information on how to combat these pests. About all the remedy I could give was the old-time one of fall ploughing and rotation of crops. On enquiries I found that only in a very few cases were peas attacked. Frequently where peas and barley were sown together, the barley was destroyed and the peas left. This experience could be made use of by farmers where they feared attacks from Wireworms if they sowed oats or barley. I recommended that the new remedy originated by Prof. Fernald for preventing Wireworms from attacking seed corn be tried on a limited scale. Prof Fernald puts tar on the seed in the manner practised to keep off crows, then, to dry it so that it will go through the seeder, he places it in a large bucket containing fine dust and Paris green mixed in such proportions that the corn, after being shaken up in the bucket, shows a greenish color. The corn in his two years' experiments never failed to germinate and was quite uninjured by the Wireworms, which, he thinks, were probably repelled by the covering substance rather than killed by it.

MR. NASH: Prof. Slingerland investigated a number of remedies and found that they were of no use.

MR. CAESAR: Yes, but he did not use the tar and Paris green combined in this way.

MR. NASH: You can understand that it will not act as a preventive, because the Wireworms will eat off the rootlets as quickly as formed.

MR. CAESAR: The Wireworms attacking the kernels have been in this way a great pest, and never give the corn a chance at all.

MR. NASH: It does not seem at all practicable.

DR. HEWITT: It protects the kernel, but will not protect the roots of the plant.

MR. CAESAR: Possibly the odor of the tar has something to do as a repellant.

MR. NASH: We know quite well that the tarred seed does not protect the plant at all.

MR. CAESAR: Prof. Fernald has been working on this for two years, and he claims that he has got excellent results. I was reading the other day results from further trials, and the writers claim that they did not care how badly the field was infested the corn would not be attacked if treated with the tar and Paris green. As for Prof. Fernald, it is well known that he is a thorough man in his work.

MR. NASH: They got hold of a susceptible breed of Wireworms.

MR. HOWITT: Have you found the Wireworm attacking potatoes to any extent? I came across a district around London where about 30 per cent. of the potatoes were bored through with the Wireworms.

MR. CAESAR: Yes, quite often. Have you known of the above method of controlling them, Mr. Swaine?

MR. SWAINE: I have known it to be reported upon favorably a number of times.

PEA APHIS (*Nectarophora destructor*). This very serious pest was only found locally, but in a few districts it destroyed whole fields of peas. One farmer thinks its presence on the vines has led to the death of some of his cattle by poisoning. This scarcely seems possible.

ROOT MAGGOTS (*Pegomya brassicæ* and *P. cepetorum*). These troublesome pests have been about as abundant as usual. Late cabbage has been almost free from them.

CABBAGE APHIS (*Aphis brassicæ*). Fortunately this species of insect is at last being brought under control by its natural foes, and this year in most parts of the Province did comparatively little damage.

SPRUCE GALLS (*Chermes sp.,*) Plate B, Figs. 6 and 7. Some attention has been given to spruce galls this year, chiefly by my summer assistant, Mr. W. A. Ross. It has been found so far that we have on spruce in the Province, *Chermes abietis, C. similis, C. pinifoliæ,* and a species that seems to be *C. pinicorticis,* but was not studied early enough in the season to get the adults, and so make sure of its identity. Of these, *Chermes abietis* is the most abundant, and is found on Norway, Black and White Spruce. *Chermes similis* is very abundant on White Spruce, and is doing much damage. *Chermes pinifoliæ* has been found by us only at Port Hope, where I saw it on one tree, which I think was White Spruce, although it might possibly have been Black. Experiments on the control of *C. abietis* showed that because of its exposed condition it could be destroyed by an application of whale-oil soap or lime-sulphur in April. Excellent results have been obtained from the latter, both this year and last.

So far we do not know when *C. similis* can be best attacked. It looks as though it would be a much harder species to combat than *C. abietis.* In spring it is so enveloped in a flocculent mass that lime-sulphur has no effect on it, and probably an oil spray would likewise be ineffective.

DR. WALKER: Did you say you found *Chermes pinifoliæ* on the White Spruce?

MR. CAESAR: I have been looking for it wherever I have gone, and only found it in Port Hope.

DR. WALKER: I have seen it at Nipigon, on the north shore of Lake Superior, confined to a single tree, and had to hunt a good deal to find as many as eight or ten specimens. I took it to be *C. pinifoliæ,* but may be mistaken. I think it was also this species that was sent to me from Snelgrove. I have found *C. similis* only on White and Black Spruce, never on Norway.

MR. JARVIS: There is a species very common in the far west; it is about half an inch in length. Do you know that one?

DR. HEWITT: I have collected that same one all through Saskatchewan, Alberta and British Columbia this fall. It seems to be a more compact and more regular species. I have got here about six different species of *Chermes.* The box has been arranged for me by Miss Patch. I find that *floccus* and *similis* are far more common than heretofore supposed. *Floccus,* I think, occurred in Quebec this year, too.

MR. CAESAR: We have not found *C. floccus* in Ontario yet.

THE MORE INJURIOUS INSECTS IN CANADA DURING THE YEAR 1910.

C. GORDON HEWITT, D.SC., DOMINION ENTOMOLOGIST, OTTAWA.

As reference has already been made by the directors of the various districts in eastern Canada, and by Mr. Caesar, to those insects which have been brought to their notice as being more or less prevalent and injurious, it remains for me to briefly mention those insects which have occurred in other parts of Canada, or whose injuries have been more than usually serious.

In the northern districts of Saskatchewan considerable damage has been caused by the RED-BACKED CUTWORM (*Paragrotis ochrogaster,* Gn.), the injuries being chiefly to wheat. Another cereal pest, especially upon oats, which seems to be spreading is a species of Thrips. Oats which had been injured by this insect were received from Quebec, Saskatchewan, Alberta and British Columbia. It produces a characteristic whitened appearance of the ears.

The WESTERN BLISTER BEETLE (*Cantharis nuttalli,* Say) was very abundant in the western provinces of Manitoba, Saskatchewan and Alberta, where it was reported as injuring chiefly peas.

The POTATO BEETLE (*Leptinotarsa decemlineata,* Say) is gradually working its way north in Alberta, its northern limit at present being somewhere in the neighborhood of Edmonton.

The HOP FLEA-BEETLE (*Psylliodes punctulata,* Melsh.) was again serious in British Columbia, but on some of the ranches the Red Spider was a much more serious pest. The manager of one hop yard stated that it was compelling them to cease growing hops. In one locality, where a crop of six or seven hundred pounds of hops to the acre is usually produced, they were reduced to two hundred pounds to the acre by the ravages of the spider, and the resulting hops were of very poor quality. The destruction of the mite wintering in the hop poles would appear to be the best method of controlling it, as they were found there in large numbers. This can be accomplished by dipping the poles in a caustic solution, such as lye, or in coal oil.

One of our most serious pests in Canada at present is the **Brown-tail Moth**, now established in Nova Scotia. During the last summer we have also received the first record of its breeding in New Brunswick, a single egg mass having been found at St. Stephen, N.B. This was not surprising nor unexpected, in fact it is singular that it has not been found breeding in numbers in that locality before, in view of the fact that it extends along the coast of Maine as far north as the Ste. Croix River. In July a visit was made to the eastern States, for the purpose of studying the distribution of the Gipsy and Brown-tail Moths, and the means that were being taken to control them and to prevent their spread. One object of this visit was to ascertain to what extent nursery stock and other vegetation shipped from these States into Canada was liable to be infested with these two insects: on account of the conditions which prevailed a regulation was passed under the new Destructive Insect and Pest Act, providing that all nursery stock from the six eastern States: Connecticut, Rhode Island, Massachusetts, Maine, New Hampshire and Vermont shall be inspected at the point of destination. Reference may be made here to the passing of the "Destructive Insect and Pest Act" during the last session of Parliament. With the Brown-tail Moth and the San José Scale already within our borders there was urgent need for legislation which would enable the Federal Department of Agriculture to take such measures as would insure, so far as is humanly possible, the freedom of nursery stock and other vegetation from serious pests which are liable to enter Canada by such means. It was also necessary for the Minister of Agriculture to be empowered to carry out such eradicative measures as shall be considered necessary to combat those insects which have already established themselves in the country. Briefly, then, the new Act provides for the fumigation of imported stock when it is necessary for the San Jose Scale, the inspection of European and certain other classes of imported stock for Brown-tail and Gipsy Moths, the carrying on of such work as shall be necessary for the eradication of those pests scheduled and the compulsory treatment on the part of the owners of trees and other vegetation infested. The insects at present scheduled are the San Jose Scale, the Brown-tail and Gipsy Moths, the West Indian Peach Scale and the Woolly Aphis. Armed with this machinery we hope to be able to fight against the introduction of those pests to which Canada, as a rapidly-developing country, is specially subject. Reverting to the Brown-tail Moth, the result of the last season's inspection in Nova Scotia would indicate that, although in certain localities the winter webs were numerous, on the whole the area infested was more restricted, thanks to the energetic action of Prof. Cumming, the Secretary for Agriculture for Nova Scotia. During the coming winter season we intend to co-operate with the Provincial Government and carry on an active campaign. It was interesting to find that the only batch of eggs discovered in New Brunswick was parasitised by a small egg parasite, apparently a species of *Trichogramma*.

Another alien which, unfortunately, has been added to our gradually increasing fauna of injurious insects, is the **Narcissus Fly** (*Merodon equestris*, Fab.). This was reported from Victoria, B.C., and during my recent visit to the district I had the opportunity of looking into the matter. It was probably introduced on Dutch bulbs. The fly somewhat resembles the Drone Fly, belonging to the same family, the Syrphidæ, and the maggot feeds in the centre of the bulb, thereby causing its death. The bulb-grower who reported this insect to the Division of Entomology had about 50,000 bulbs of narcissus and daffodils destroyed last year by the fly. On account of the habits of the larvæ it is difficult to devise effectual preventive or eradicative measures; some benefit resulted from spraying with an arsenical. Further details of the life-history and habits of the fly in Canada must be elucidated before measures can be suggested.

Last year Mr. Gibson called the Society's attention to the outbreak of the SPRUCE BUD-WORM (*Tortrix fumiferana,* Clem.), which had been reported to the Division of Entomology as causing serious defoliation of the spruce and balsam trees in the Province of Quebec, about 100 miles north of Ottawa. During my visit to British Columbia, in October of last year, it was found to be defoliating the Douglas fir on Vancouver Island, and when that region was revisited a month ago I found that the attack had been more serious this year, many young five-year old and older trees of the second growth having been killed. The area of infestation in Quebec appears to have spread also, and reports have been received from a number of owners of timber and pulp-wood limits as to the seriousness of the defoliation, which is very conspicuous from Mattawa across to the Saguenay River in Quebec. It has also been recorded from other districts in Quebec. What the results of this defoliation will be cannot be foretold. It is known that the insect was chiefly responsible for great destruction among the spruces in Maine some years ago. Now that it has spread over so wide a stretch of country nothing of a practicable nature can be done to control it. We are, therefore, studying the parasitic means of control, to which I hope to refer to-morrow, and we are also clearing up some obscure points in the life-history of the insect.

The WHITE-MARKED TUSSOCK MOTH (*Hemerocampa leucostigma,* S. and A.) has been unusually abundant in the Maritime Provinces during the past year, especially in Nova Scotia. In Halifax and Charlottetown it has caused considerable alarm on account of its defoliation of the shade trees in those cities. The citizens appear to be fully alive to the danger of the repeated defoliation of their shade trees, and it is hoped that timely destruction of the egg masses in the winter and, if necessary, spraying in the summer will be resorted to.

Mr. Caesar has already referred to the occurrence of the FOREST TENT CATERPILLAR. These insects occurred in very large numbers in New Brunswick, and also in British Columbia, where whole tracts of country were defoliated. We also received them from Edmonton, Alberta. The great abundance of the Fall Webworm, especially in some localities, was very noticeable during the past season.

Another caterpillar, of which I do not think we have yet heard the last, is the GREEN-STRIPED MAPLE WORM (*Anisota rubicunda,* Fab.). This species was reported to the Division last year as defoliating the maples in a sugar bush, and this defoliation was stated to have caused a decrease in the amount of sap obtained from the trees. During the present year it was reported as defoliating maples in the Rideau Lakes, and along the northern shores of Georgian Bay the maples were stripped of their leaves.

MR. CAESAR: Have you seen much of the Thrips in Ontario?

DR. HEWITT: I have not had any cases of the Thrips to which I refer reported as yet from Ontario.

MR. CAESAR: Does the whole of the wheat get that silvery appearance?

DR. HEWITT: It is on oats that we have found it. The white and silvery appearance of the head and stem of wheat is usually due to the wheat-stem maggot.

MR. NASH: Is the Rose Beetle generally reported?

DR. HEWITT: I do not think that we have had many reports.

MR. CAESAR: It is fairly abundant round Clarkesville.

MR. SWAINE: I might mention, Dr. Hewitt, that I found the Spruce Budworm at Hudson, P.Q., this season. Have you had it reported as far south as that?

DR. HEWITT: We have had it reported from a number of localities in Quebec, other than those which I have mentioned. I have found it within a few miles of the Vermont boundary.

NOTES ON THE SEASON OF 1910.

REV. THOMAS W. FYLES, D.C.L., HULL, QUE.

The season of 1910 has been a very fine one, interrupted, however, with heavy thunderstorms. Some interesting species of insects have come under my notice in the course of the season.

EUCOSMA SCUDDERIANA, Clemens The galls of *Eucosma scudderiana* have been very abundant. They begin to appear on the Golden Rod early in June. They are somewhat irregular in shape, and are covered with a rusty-looking scurf.

The larva is greenish-white. Its head is of a dark madder-brown; and the plate on the second segment is spotted with brown. On the body are numerous oval tubercles or plates. The spiracles are small and brown.

This species continues in the larval stage through the winter, and does not go into pupa till May. I have opened galls in March and April and found the larvæ active. They feed on the pith above and below their galls. The moths appear at the end of May.

Holland, in his beautiful and very useful work, "The Moth Book," telling of *Eucosma scudderiana,* says—

"The insect is not uncommon in western Pennsylvania, and is possibly an inquiline or intruder in the galls which are produced by another species, *Gnorimoschema gallæ-solidaginis,* Riley."—*The Moth Book,* p. 418.

The author is mistaken here. The galls of *G. gallæ-solidaginis* begin to appear at the same time as those of *scudderiana,* at a time when the moths of both species have passed away. It is not likely that a *scudderiana* larva would leave its own gall to go in search of one of the other kind.

The galls of *G. gallæ-solidaginis* may be readily known: they are of the shape of a half-grown turnip-radish; and they have not the rusty apearance of the Eucosma gall. *The moths from them appear in the month of August.*

TETRASTICHUS GELECHIAE, Ashmead. I have found two galls of *G. gallæ-solidaginis* this season—one at Abercorn in the eastern townships, and the other at Hull—in which the pupæ appeared abnormally large. By aid of the microscope I found that the enlargement was caused by the closely-packed chrysalids of a parasite *Tetrastichus gelechiæ.* The flies in due time appeared.

CAMPONOTUS PENNSYLVANICUS, DeGeer. On June 14th—a very hot day—there was a remarkable flight of the large, black Carpenter Ants (*Camponotus pennsylvanicus*). The creatures were everywhere in the streets of Hull; but they were not abundant long, for the sparrows regarded a Black Ant as a *bonne bouche,* and banquetted upon the unexpected provision to their hearts' content. Useful sparrows! May the memory of Colonel Rhodes, who introduced them to Canada, be honoured!

A STRANGE BUTTERFLY. On August 8th I captured a curious melanic form of *Argynnis myrina,* Cramer. Both the primaries and secondaries of this insect were suffused on the upper side with sooty black; but in the secondaries the inner margins, and a few spots in the centre of each, were of the normal color. On the under side the primaries were dusky brick red, with sooty black patches between the veins. The marginal silvery spots appeared. The secondaries on the under side were of a rich chocolate red. The black spot towards the base of each was enclosed by a narrow silvery ring. The spots were as usual. The body was black above and yellow beneath.

MONONYCHUS VULPECULUS, Fab. At Quyon, Province Quebec, on August 17th, I found that the seed-pods of the Blue Flag (*Iris versicolor*) were much infested with a small beetle (*Mononychus vulpeculus*), in all its stages. The larvæ and pupæ were waxen in appearance. The beetle was a trim and handsome little insect. The following is a description of it:—Length, 5 millimetres; breadth, 3 millimetres. Color above, deep seal-brown. Elytra and thorax bordered with yellow. Thorax granulated. Elytra roughly striated. Eyes small and black, close to the proboscis.

Color beneath, that of burnt sienna on the sides, and grey under the abdomen and between the legs. Femora and tibiæ furry. Femur stout, somewhat flask-shaped. Tarsi ending with two pads or cushions, side by side, with a claw between them. Joints of tarsi very distinct.

Proboscis extending between the front pair of legs, as far as the middle pair; blunt, scaly—the upper part sienna-colored; the lower, dark grey.

I am indebted to the kindness of Dr. Howard and Prof. Schwarz, of the U. S. Bureau of Entomology, for the determination of the beetle.

I obtained from the affected Iris pods a considerable number of specimens of the parasite *Pimpla inquisitor,* Say.

HEMIPTERA ON THE MILK VETCH.

On September 1st, on a small patch of Milk Vetch (*Astragalus canadensis*), growing at Aylmer, Province Quebec, I found no less than six kinds of bugs. Amongst them were:—*Alydus conspersus,* Mont., and *Megalotomus quinquespinosus,* Say.

A. conspersus is black with an orange patch on the abdomen above. This can be seen only when the wings are spread.

M. quinquespinosus is a handsome insect, of a neat ochreous color. Its abdomen has black edges marked with pale yellow spots. It was named from the five spines on the femur of each of its hindmost legs.

For the identification of these two bugs I am indebted to Prof. Heidemann.

BASILONA IMPERIALIS, Drury.

On October 2nd, Miss Effie Garrioch sent me, from Marshall's Bay, on the Ontario side of the Ottawa, three larvæ of *Basilona imperialis.* They were full fed, and went into the earth on the evening of their arrival. Two of them were of the deep green of the pine foliage; the other was of a rich rosy brown. They changed to pupæ on the 10th of the month. The following is a description of these remarkably handsome caterpillars:—Length, 3 inches; diameter, 5-6 inch. Head lobed, black, with clay-yellow upright markings in front, and paler yellow marks on the sides.

Forelegs, clay-yellow with black tips. Prop-legs, dark brown with a clay-yellow bar across them.

Body color a dark green—sometimes a rosy brown—with a purple dorsal-line, and a broad faintly purple band along each side.

The second segment has a black shield with four glossy warts on the front edge of it.

On the third, and again on the fourth, segment are two prominent warts, one on each side of the dorsal-line, pale yellow at the base and tip, and black, spotted with yellow, in the middle. In line with each of these pairs of warts, and on the seven next following segments, are creamy-white, pointed warts—one on either side of each of the segments. On the twelfth segment, at the top, is a glossy black, prominent wart, tipped with yellow; and, a little behind it, are two small black warts. On the top of the thirteenth segment is a small black wart, faced with yellow. Along the purplish sideband, from segment three to segment twelve, there is a row of creamy-white, pointed, warts; and along the base, above the legs, from segment two to segment thirteen, on either side, is a row of similar, but smaller warts.

The spiracles are conspicuous, large, creamy-white, bordered with black.

The claspers are remarkably large. They are surmounted by a large triangular shield, edged on two sides with clay-yellow, and dotted with white. The claspers are bordered and dotted in the same way.

The creature is sparsely set, with light, brownish-yellow, bristles.

Pelopaeus cementarius, Drury. Adjoining the Matthews' Factory at Hull there is an electrical sub-station, belonging to the Hull Electric Company. In this station, three yards from a window, a telephone is affixed to a wall. One day, in August last, the man who occasionally visits this sub-station found that the telephone was out of order, and gave notice of this at the head office. The superintendent, Mr. Alfred Gale, went to see what was wrong, and, on opening the magneto-box, found a number of Mud-Wasps at work, piling up their cells upon the bar, which terminates on the outside of the box in the hook, or fork, in which the receiver is placed. Within the box, the spring, under the bar, was not strong enough to raise the additional burden; and consequently, no pressure was brought to bear upon the contact points, and the telephone failed to work.

The wasps found ingress to the magneto-box through the slot in which the bar plays.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for the year 1909-1910.

The forty-sixth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 4th and 5th, 1909. There were a goodly number present from a distance as well as a large attendance of students and others connected with the College.

During the first afternoon the reports of the Directors on the insects of the year were read and discussed, papers were read by Mr. L. Caesar on "A few insects of the season"; by Mr. A. Gibson on "Nests of the Brown-tail Moth in importations of French nursery stock"; by Dr. C. Gordon Hewitt on "The large Larch Sawfly"; by Mr. R. C. Treherne on "Nursery work in Ontario," and by Mr. F. J. A. Morris on "Some Guests at the Banquet of Flowers." In the evening a public meeting was held in Massey Hall, which was well filled with members and students from both the Agricultural College and the Macdonald Institute. A very interesting lecture on "House Flies and their Allies," illustrated with excellent lantern pictures, was delivered by Dr. C. Gordon Hewitt, the newly appointed Dominion Entomologist.

The morning and afternoon of the second day were occupied with the reading of the reports of the various branches and officers of the Society, and a number of papers on a variety of subjects, which have all been published in the Annual Report for 1909. This volume, the fortieth of the series, was issued in May last and contained 144 pages, illustrated with 6 full-page plates, 39 figures in the text and a portrait of the late Dr. William Brodie. In addition to the papers already mentioned, the volume contained the following articles: "The origin and diffusion of Entomological Errors," by Mr. H. H. Lyman; "Conflicts between Ants," by Mr. G. E. Sanders; "The Snow-white Linden Moth," by Mr. A. F. Winn; "Notes on Fruit-tree Scolytids," by Mr. J. M. Swaine; "Observations on Ontario insects in 1909," by Dr. Bethune; "Injurious Insects of Quebec in 1909," by Prof. Lochhead; "Adaptations in the structure of insects" and "Anisota virginiensis," by Dr. Fyles; "The Acarina, with a Host Index to the species found in Ontario," by Prof. T. D. Jarvis; "The Spruce Bud-worm" and "'The Entomological Record for 1909," by Mr. Arthur Gibson; concluding with a sympathetic obituary notice of the late Dr. Brodie, by Mr. Frank Morris.

The *Canadian Entomologist,* the monthly magazine of the Society, has been regularly issued at the beginning of each month. The forty-first volume was completed in December last; it consisted of 440 pages, and was illustrated with 11 full-page plates and 13 figures from original drawings. The contributors numbered 73, and included writers in Ontario, Quebec, British Columbia, England, sixteen of the United States, the Hawaiian Islands, Panama Canal Zone; Calcutta, India; and Russia. During the year seven new genera were described and 239 new species, sub-species and varieties.

At the close of the volume, Dr. Bethune resigned the position of editor, which he had held since October, 1886, owing to the disability caused by impaired eyesight in addition to the weight of advancing years. His place has been ably filled by Dr. E. M. Walker, Lecturer in Zoology at the University of Toronto, and the magazine has continued to be issued with unimpaired excellence.

Meetings of the Society were held during the winter months at the Ontario Agricultural College on alternate Wednesday afternoons. The attendance included several of the more advanced students and much interest was taken in the papers and discussions. The following subjects were taken up during the course of the meetings: "Achievements in Economic Entomology," illustrated with lantern pictures, by Prof. Bethune; "Insects as causes of disease, with special reference to the Protozoa," by Prof. Jarvis; "The Insects of Saskatchewan," by Mr. S. J. Neville; "Aphids," by Mr. A. C. Baker; "An account of the Meeting at Boston of the American Association for the Advancement of Science," by Mr. L. Cæsar; "Notes on the Calliphorinean Genus Lucilia," by Mr. J. D. Tothill.

The unveiling of the drinking fountain erected in the grounds of the Central Experimental Farm at Ottawa in memory of our late President, Dr. James Fletcher, took place on Tuesday afternoon, July 19th, and was largely attended. Our Society was represented on the occasion by two former Presidents, Dr. William Saunders, Director of the Dominion Experimental Farms, and Dr. Bethune, of the Ontario Agricultural College, who both took part in the proceedings by giving short addresses. There were also present a number of our members resident in Ottawa and the neighborhood.

The first International Congress of Entomology was held during the month of August last at Brussels and was in every respect a complete success. Our Society was represented by our former President, Mr. Henry H. Lyman, of Montreal, who read a paper on Nomenclature. He has furnished us with an interesting report of the proceedings.

It is with much regret that the Council has learned that the members in Quebec have been unable to maintain the branch of the Society which for many years was in successful operation there. The removal of the Rev. Dr. Fyles has taken away the most active member whose enthusiasm inspired the rest of the members and kept up the meetings with great interest. No one has so far been found to take his place, and accordingly the operations of the branch have been suspended.

A similar fate, we regret to say, has befallen the branch of the Society in British Columbia. Mr. R. V. Harvey, Headmaster of the University School at Victoria, has found his time so much occupied that he has been unable to give any attention to the work of the branch. Its operations have on this account been suspended for the time being, but it is hoped and expected that before very long its operations will be resumed. The great difficulty consists in the geographical distribution of the members, who are very widely separated from one another and consequently are unable to hold meetings.

The Council has to deplore the loss of Mr. G. W. Kirkaldy, of Honolulu, who died in San Francisco on the 2nd of February last. He was a very able and energetic entomologist and contributed frequently to the pages of our magazine. He especially devoted himself to the Hemiptera, and had begun a catalogue of the species throughout the world, the first volume of which has just been issued.

Respectfully submitted,

TENNYSON D. JARVIS, *President.*

FIRST INTERNATIONAL CONGRESS OF ENTOMOLOGY.

HENRY H. LYMAN, MONTREAL, QUEBEC.

If anyone entertained any doubts of the possibility of making a Congress devoted exclusively to Entomology a success, such doubts must have been dispelled by the results of the First International Congress of Entomology held at Brussels from August 1st to 6th, 1910.

A correspondent of the London *Times* writing of the Congress said: "Entomology is at last recognized officially as an important science. The study of insects, so long looked upon with disdain as a pastime for children and old men, has at last vindicated its claim as a valuable branch of human mental activity. That is to say, from being a purely intellectual exercise, entomology has developed a most important practical aspect that will, in the near future, have a profound and far reaching effect upon the lives and fortunes of millions. The discovery of the astonishing phenomenon that one species of mosquito, and one only, is the vehicle for the transmission of yellow fever, another of malaria, while a single kind of biting fly communicates sleeping sickness to the teeming millions of the African continent, has a direct and vital influence upon tropical medicine; and the Americans have long since realized that an accurate knowledge of the habits of one kind of beetle may save agriculturists from damage that may result in the loss of hundreds of thousands of pounds. Thus entomology has won the serious attention of practical men who, acting together with the purely academical devotees of the pure science, have demonstrated their attachment to and appreciation of their study by organizing an International Congress that has received the hearty support of institutes, departments and governments."

The following important bodies were represented at the Congress: the British Colonial Office, the Tropical African Entomological Research Com-ittee. Cambridge University, Oxford University, the Board of Agriculture, the Royal Colonial Institute, the Imperial Department of Agriculture in the West Indies, the British (Natural History) Museum, the Royal Society, the Linnean Society, the Zoological Society, the Entomological Society of London, the University of London, the Commonwealth of Australia, the Commonwealth of South Africa; the Royal British Arboricultural Society, the University of Edinburgh, the East of Scotland College of Agriculture, the Royal College of Science of Dublin, the Agricultural Research Institute of Pusa, Bengal; the Carnegie Institute of Pittsburg, the Entomological Society of America, the Academy of Natural Sciences of Philadelphia, the Entomological Society of Ontario, etc., etc.

Besides entomologists residing in Brussels, delegates were also present from other parts of Belgium and from Madrid, Zaragoza, Barcelona, The Hague, Leyden, Amsterdam, Berlin, Zürich, Königsberg, Vienna, Bologna, Genoa, Milan, Luxemburg, Paris, St. Petersburg, Moscow, Budapest, Pittsburg, Philadelphia, Columbus, Montreal, Tokio, Buenos Ayres, etc.

On the evening of Sunday, July 31st, a reception was held by the Entomological Society of Belgium for those attending the Congress and accompanying ladies at the Maison des Medicins, while the first meeting of the Congress was opened the following morning at the Salle des Fêtes of the Exhibition by the President of the Congress, Prof. Auguste Lameere, Rector of the Free University of Brussels, the Secretary being Mr. G. Severin.

The meetings were divided into general sessions and sectional meetings, ten sections being arranged for as follows:—

1. Systematics.
2. Nomenclature and Bibliography.
3. Museology and History of Entomology.
4. Zoogeography.
5. Bionomy, Œcology, Cecidiology and Mimicry.
6. Physiology and Psychology.
7. Economic Entomology
8. Medical Entomology.
9. Anatomy and Ontogeny.
10. Phylogeny, Palæontology and Evolution.

Members were given a very handsome silvered bronze badge of Gothiç design, having on the obverse an illustration of the Hotel de Ville and "Bruxelles," "1910," and on the reverse "1r Congrès International d'Entomologie," and, by the courtesy of the Exhibition Committee, passes to the Exhibition for the term of the Congress.

The more serious work of the Congress was varied by visits to the Exhibition, museums, excursions and receptions. At the Royal Museum of Natural History an excellent portrait group was taken.

Among the most important papers read may be mentioned a lecture by Dr. R. Blanchard, of Paris, on Medical Entomology, dealing with the transmission of malaria, yellow fever and sleeping sickness, and it may be mentioned that there was a most interesting exhibit in connection with these subjects in the Exhibition. Mr. Theobold, of Wye College, gave a lecture on the distribution of *Stegomyia fasciata,* the conveyer of yellow fever. Sir Daniel Morris described the methods employed by the Imperial Department of Agriculture in the West Indies to prevent the introduction of insect pests by fumigation and quarantine. Dr. G. H. Carpenter, of the Royal College of Science, Dublin, gave an instructive account of the warble fly, *Hypoderma bovis.* He declared the so-called preventive washes quite useless, but had not concluded his investigations.

Dr. R. Stewart MacDougall, of Edinburgh University, described the ravages of a small beetle, *Galerucella lineola,* that has done an immense amount of damage to the osier beds in the Midland and Eastern counties of England, and recommended arsenical sprays for its control.

Good lectures on Ants and their guests and enemies were delivered by Father Wasman, S.J., of Luxemburg, and Mr. H. S. K. Donisthorpe, of London, with lantern slides, showing the various domestic animals kept and used by the ants.

The highly interesting study of mimicry was dealt with by Prof. E. B. Poulton, of Oxford, who exhibited a large number of boxes of butterflies, all caught in one small patch of forest in Uganda, showing the common species which are distasteful to birds and other enemies, and the rarer species which, though belonging to a totally different group, and in no way related structurally, enjoy a relative immunity from attack by a very close resemblance to the distasteful forms. Dr. F. A. Dixey, Mr. Frederick Merrifield, and Dr. K. Jordan also spoke on the same subject.

Prof. Y. Sjostedt, of the Natural History Museum, of Stockholm, gave an account of the Swedish expedition of twelve months to Kilimandjaro and its prolific results.

Mr. J. N. Howlett, of Pusa, Bengal, described the difficulties of preserving collections of insects in the climate of India. Dr. Holland spoke on the preservation of type specimens, and Dr. Henry Skinner read a paper on One Hundred Years of Entomology in the United States, but ignoring the influence exerted upon it by the *Canadian Entomologist.* He referred to the steady and great growth of Economic Entomology during recent years and the very large sums appropriated by the Federal and State Governments for the control of injurious insects.

On the last afternoon a brief paper was read by Mr. Lyman, urging the importance of an authoritative pronouncement upon the correct use of such terms as type, co-type, etc., and of universal adhesion to such use and protesting against changes by some authors in the spelling of scientific names.

The number of adherents reported was 270, but the list of those reported as attending the Congress gave 141 names of gentlemen, many being eminent in the science, and 32 ladies accompanying delegates. And of all countries represented the British Empire had the largest number of delegates.

The representatives of the United States were Dr. Holland, Dr. Skinner and Mr. Osborn, while Mr. Lyman was the only representative from Canada.

At the last General Session on the morning of Friday, August 5th, the election of a Permanent Committee took place, and it was decided to hold the next Congress in the summer of 1912, and on the invitation of the gentlemen from Oxford that ancient seat of learning was selected as the next place of meeting, and Prof. Poulton was chosen President.

The Permanent Committee for the United States consists of P. P. Calvert, T. D. A. Cockerell, J. H. Comstock, H. C. Fall, C. P. Gillette, W. J. Holland, A. D. Hopkins, L. O. Howard, C. W. Johnson, V. L. Kellogg, H. Osborn, J. B. Smith, C. W. Stiles, C. Wellman, W. M. Wheeler, and for Canada C. J. S. Bethune, C. G. Hewitt, H. H. Lyman; while the Permanent Executive Committee consists of M. Burr, K. Jordan, W. Horn, P. Lesne, G. Severin and H. Skinner.

The conclusion of the Congress was celebrated by a grand banquet on Friday evening at the Taverne Royale, participated in by the ladies accompanying some of the delegates, when after the inner man (and woman) had been satisfied with the excellent repast served in the best style, many speeches were made and good fellowship prevailed. The gathering broke up before midnight, as all-day excursions had been arranged for the next day, the majority going to Bruges and Ostend.

The concluding reception was the grand one given at the old and wonderful Hotel de Ville by the Burgomaster, Mons. Max, on Sunday evening, August 7th, when that magnificent building, so rich in beautiful architecture, tapestries, pictures, frescoes and bric-a-brac, was thrown open to the guests of the city. Thus, amid scenes of brilliance and splendour in this stately mediæval building, came to an end this First International Congress of Entomology, all looking forward with pleasure to the next meeting at Oxford in 1912.

ANNUAL REPORT OF THE MONTREAL BRANCH.

The thirty-seventh annual meeting of the Montreal Branch was held at 74 McTavish Street, on Saturday evening, May 14th.

Members present: Messrs. H. H. Lyman, in the chair; G. A. Southee, G. Chagnor, E. C. Barwick, Geo. A. Moore, A. E. Norris, W. G. Gerth, and A. F. Winn.

The minutes of the April meeting, and of the last annual meeting, were read and confirmed.

Mr. H. Earby was elected a member of the Branch.

The Secretary read the following

Report of the Council.

Nine meetings have been held during the season 1909-'10, the average attendance being a fraction over 9, which is an improvement on the previous year; but, considering that the population of Montreal is over 600,000, there should be more than a score of persons interested in Entomology. Three new names have been added to our roll, but three others have resigned.

Below is a list of the papers read (most of which were illustrated by specimens), and the discussions following them were of interest.

Annual Address of the President, Geo. A. Moore.
A Spring Outing, H. H. Lyman.
Lepidoptera taken at St. Hilaire, May 24th, 1909. A. F. Winn.
Notes on Coleoptera taken at St. Hilaire, May 24th, 1909, G. Chagnon.
Life History of Philometra metonalis, H. H. Lyman.
How can we increase the interest in our meetings? H. H. Lyman.
My Best Captures in 1909, G. Chagnon.
Occurrence of Ennomos subsignarius at Montreal, A. F. Winn.
Hemiptera taken at St. Hilaire, G. A. Moore.
Proposed List of Insects of the Province of Quebec. A. F. Winn.
Account of Annual Meeting and a Visit to Trenton, A. F. Winn.
On Panthea and Demas, H. H. Lyman.
A New Scolytid Enemy of White Spruce, J. M. Swaine.
The Winter Quarters of Doryphora clivicollis, A. F. Winn.
Our White Butterflies, A. F. Winn.
Calligrapha rowena, G. Chagnon.
Paonias astylus at Biddeford, Me., A. F. Winn.
The Berytidæ, or Stilt-bugs, G. A. Moore.
Random Notes on Lepidoptera, A. F. Winn.
An Hour at Montmorency, H. H. Lyman.
The Noctuidæ and how to Collect Them, I., A. F. Winn.
Butterfly Collecting in British Columbia (by John Russell, Hope, B.C.), read by A. F. Winn.
The Cydnidæ or Burrowing Bugs, G. A. Moore.
The North American Copper Butterflies, H. H. Lyman.

The annual outing at St. Hilaire, on Victoria Day, was well attended, but the backward season made the captures of insects much smaller than usual, but among the Coleoptera several good catches were made and the Lepidopterists had the pleasure of finding two specimens of a little Heliothid moth, probably undescribed, closely resembling *Heliaca nexilis* of the Rocky Mountains. No species of the genus have hitherto been recorded from the East.

At the January meeting we had the pleasure of a visit from Mr. F. H. Wolley Dod, of Millarville, Alberta, who gave an account of his visits to collectors of Noctuidæ throughout Canada. It was hoped that the Rev. Dr. Fyles would be able to attend our meeting this evening, but it could not be arranged.

The annual meeting of the parent Society at Guelph was attended by the President and the Secretary.

The report of the Treasurer shows a balance on hand of $76.79.

The Curator reports that the specimens in his charge are in good condition but that no additions have been made to the collection and that the members have made little use of either the specimens or the books. It is probable in connection with the preparation of the List of Insects of the Province of Quebec that a considerable number of specimens of the more neglected orders will be collected, determined and eventually find their way into our collection. The books added to the library consist of a copy of Pierce's "Genitalia of British Noctuidæ," the current volume of the *Canadian Entomologist,* and the entomological publications of N.Y. State.

Respectfully submitted on behalf of the Council.

(Signed) ALBERT F. WINN, *Sec.-Treas.*

Mr. Lyman then read his annual address, after which the election of officers for the ensuing year was proceeded with, and last year's officers were all re-elected, namely: Henry H. Lyman, President; G. A. Southee, Vice-President; A. F. Winn, Secretary-Treasurer; L. Gibb, Curator and Librarian; Members of Council—G. Chagnon, G. A. Moore, E. C. Barwick, F. Parkins, jr.

ANNUAL REPORT OF THE TORONTO BRANCH.

The 51st regular and 14th annual meeting of the Toronto Branch was held in the Biological Department of the University of Toronto, on June 9, 1910.

During the year eight meetings have been held with an average attendance of seven members. The place of meeting has been changed from the Normal School to the Biological Building, and library and collections have been moved.

The following papers were read:—

White Pine Weevil, Dr. E. M. Walker.
Structural Peculiarities of Galls, A. Cosens.
A Month at the Biological Station at Go Home Bay, J. B. Williams.
The Relation between Parasitism and Structure in Insects, Dr. Walker.
Wing Venation, Arthur Smith.
The Work of Scolytid Beetles in Queen's Park, Toronto, Dr. Walker.
The Oriental Moth, H. H. Lyman, of Montreal Branch.
A Hunt and What Came of It: Discovery of *Copidosoma Lymani*, H. H. Lyman, of Montreal Branch.
Some Types of Saw-flies, A. Cosens.
The Larch Saw-fly, Dr. Walker.

The following officers were elected for the next year:—

President—Dr. E. M. Walker; Vice-President, A. Cosens; Secretary-Treasurer, Arthur Smith; Librarian-Curator, J. B. Williams; Council—Messrs. Wood, Laing, Ivey, and Dr. Abbott.

The Treasurer's report shows a balance on hand of $0.20.

ARTHUR SMITH, *Secretary-Treasurer.*

REPORT OF THE LIBRARIAN.

During the year ending September 30th, 1910, eighteen bound volumes have been added to the Library, making the total number on the register 2,018; there are besides a number of volumes of periodicals in the hands of the bookbinder, which should have been ready for inclusion in this report. The Library continues to receive by exchange a large number of serial publications, bulletins, and pamphlets from many different countries and in a variety of languages, many being of great scientific value. A card catalogue of the bound volumes was made during the winter, but has not yet been finally completed for reference; to make it entirely useful it will be necessary to rearrange all the books in the Library on a definite system; it is hoped that this may be accomplished before very long.

Among recent additions may be mentioned the following works: Sir George Hampson's Catalogue of the Lepidoptera Phalænæ in the British Museum, volume viii.; Rothschild and Jordan's Revision of American Papilios; Needham's General Biology and Lefroy's Indian Insect Life.

The Library is constantly made use of by the senior students and members of the staff during the College year and is highly appreciated by them.

Respectfully submitted,

CHARLES J. S. BETHUNE, *Librarian.*

THE CURATOR'S REPORT.

The Society's collections have been carefully examined from time to time throughout the year and the necessary precautions taken against injury from museum pests or from other causes. Since the last annual meeting, 268 new specimens have been added. Of these 262 were contributed by Mr. John D. Evans, of Trenton, 134 belonging to the order Hymenoptera, and the remainder to the Hemiptera. As these orders are not at all fully represented in the Society's collections, Mr. Evans' gift is very valuable and will be much appreciated by the members. The remaining 6 specimens were contributed by the curator from insects of some economic importance not found in the collections.

Respectfully submitted,

L. CAESAR, *Curator.*

REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

REV. THOMAS W. FYLES, D.C.L., HULL, QUE.

I have the honour to present the following report from the Entomological Society of Ontario:—

This Society held its forty-sixth annual meeting in the Ontario Agricultural College, Guelph, on the 4th and 5th days of November last. There was a large attendance—members from Ottawa, Toronto, Montreal, Port Hope, Trenton, Grimsby and Guelph being present. Important subjects were brought before the meeting by the district directors and discussed: The destruction of cut-leaf birch trees by the Red-necked Borer; attempts to control the Tussock Moth; the extension of the San José Scale to Prince Edward County; the work of the Blackberry Saw-fly; that of the Spruce Gall-louse; the importation of Brown-tail Moth larvæ on French nursery stock; and other matters of interest to fruit-growers and foresters.

In the evening a public meeting was held in the Massey Hall auditorium, which was well filled with students of the College, both male and female, and a number of visitors from the town, together with members of the Society gathered in session. "Dr. C. Gordon Hewett, the newly-appointed Entomologist at the Experimental Farms of the Dominion, gave a highly interesting and instructive address, illustrated by a series of admirable lantern pictures, on 'House Flies and Their Allies.' The College orchestra added much to the enjoyment of the evening by the musical selections they rendered." (*Can. Ent.*, vol. xli., p. 429.)

In the forthcoming Annual Report of the Society, the papers read before the meeting will be found in full. The titles of them denote their interest to naturalists and to the agricultural community. They are:—

Observations on Insects of the Season, L. Caesar.
Injurious Insects of Ontario, C. J. S. Bethune.
Injurious Insects of Ottawa, A. Gibson.
Injurious Insects of Quebec, W. Lochhead.
The Origin and Diffusion of Entomological Errors, H. H. Lyman.
Some Guests at the Banquet of Blossoms, F. J. A. Morris.
Nests of the Brown-tail Moth, A. Gibson.
Nursery Inspection Work in Ontario, R. C. Treherne.
House-flies and their Allies, C. G. Hewitt.
The Larch Saw-fly, C. G. Hewitt.
Conflicts between Two Species of Ants, G. E. Sanders.
Snowy White Linden Moth, A. F. Winn.
Adaptations of Insect Structure, T. W. Fyles.
The Life-history of Anisota virginiensis, T. W. Fyles.
The Acarina found in Ontario, T. D. Jarvis.
Notes on Fruit-tree Scolytids, J. M. Swaine.
Entomological Record for 1909, A. Gibson.
The Spruce Bud-Worm Tortrix, A. Gibson.
Memoir of Dr. Brodie, F. J. A. Morris.

The Report is illustrated with a portrait of the late Dr. Brodie and with five half-tone plates. There are also thirty-nine illustrations in the text.

The *Canadian Entomologist*, the monthly organ of the Society, maintains its well-earned reputation. From its mail list for last month it appears that the magazine is not only circulated in Canada, but is taken in the United States, in fourteen countries of Europe, in India, Japan, the Philippine Islands, Egypt, Cape Colony, Natal, Portuguese E. Africa, Australia, New Zealand, Tasmania, Brazil, the Argentine Republic, Uruguay, Hawaii, and in five of the West Indian Islands.

The volume for 1909, the forty-first volume, contains articles from seventy-three contributors. Amongst these are correspondents in Calcutta, Honolulu, Panama, and St. Petersburg. These facts show how widely the influence of the Society extends. In this volume no less than two hundred and twenty-eight newly discovered species of insects are brought into notice and named, together with fourteen sub-species and eight varieties. The following are the titles of some of the more important of the articles that appear in the volume:—

Preparation of Beetles for the Microscope, H. F. Wickham, Iowa City.
Lepidopterous Galls collected in the Vicinity of Toronto, Dr. Wm. Brodie.
Notes on Tenthredinoidea, with Description of New Species, S. A. Rohwer, Boulder, Colo.
New Histories and Species in Papaipema (Hydrœcia), Henry Bird, Rye, N.Y.
The Fruit-infesting Forms of the Dipterous Genus Rhagoletis, with One New Species, J. M. Aldrich, Moscow, Idaho.
Some North American Jassidæ, E. D. Ball, Logan, Utah.
On the Orthoptera of Northern Ontario, E. M. Walker, Toronto.
New Coleoptera from the South-West, H. C. Fall, Pasadena, Calif.
Some New Bees, and Other Notes, T. D. A. Cockerell, Boulder, Colo.
Some Curious Californian Leaf-hoppers, E. D. Ball, Logan, Utah.
The Hepialidæ, or Ghost-moths, Albert F. Winn, Westmount, Que.
Some New Species of N. A. Geometridæ, John A. Grossbeck, New Brunswick, N.J.
List of Siphonaptera of California, M. B. Mitzmain, San Francisco, Calif.
A Summer with Chrysophanus Dorcus, William W. Newcomb, M.D., Detroit, Mich.
New Geometrids of the Genus Hydriomena, L. W. Swett, Boston, Mass.
Notes on Pachybrachys, and Descriptions of New Species, Fred. C. Bowditch, Brookline, Mass.
Studies in the Caraboidea and Lamellicornia, Thomas L. Casey, Washington, D.C.
Some Recent Contributions to Hemipterology, J. R. De la Torre Bueno, White Plains, N.Y.
Coccidæ from the Society Islands. R. W. Doane and Evelyn Hadden, Stanford University, Calif.
New Pseudoscorpionida, Nathan Banks, East Falls, Church, Va.
Notes on the Larva and Pupa of Sthenopis thule, J. M. Swaine, Macdonald College, P.Q.
A New Genus and Some New Species of Tenthredinidæ, Alex. D. Macgillivray, Ithaca, N.Y.
Notes on the Preparatory Stages of Philometra metonalis, Henry H. Lyman, Montreal.
Synonymical and Descriptive Notes on North American Heteroptera, Edward P. Van Duzee, Buffalo, N.Y.
Notes on Lachnus caryæ, H. F. Wilson, U. S. Dept. Agr., Bureau of Entomology.
Hemiptera, Old and New, G. W. Kirkaldy, Honolulu, Hawaiian Islands.
Some Guests at the Banquet of Blossoms, F. J. A. Morris, Trinity College School, Port Hope, Ont.
Phylogeny of the Lithocolletid Group, Annette F. Braun, Univ. of Cincinnati, Ohio.
The Eupitheciæ of Eastern North America, George W. Taylor, Nanaimo, B.C.

The volume also contains obituary notices of Mr. G. W. Peck and Professor M. V. Slingerland, and a memoir of William Henry Edwards—all well-known entomologists.

Eleven plates and thirteen other illustrations add interest to the volume.

At the close of last year the Rev. C. J. S. Bethune, who had conducted the *Canadian Entomologist* for many years with great care and ability, found it necessary to retire from active editorial work, much to the concern of the members of the Society, who have highly appreciated his services. However, a worthy successor in the editorship of the magazine has been found in Dr. E. M. Walker, of the Biological Department of Toronto University.

Dr. Bethune has been appointed *editor emeritus* by the executive of the Society.

In the Society's library at Guelph there are more than two thousand bound volumes and a very large number of unbound publications, bulletins, proceedings of societies, etc.

The Society's cabinets contain a very complete collection of the Lepidoptera and Coleoptera of the Provinces of Ontario and Quebec and a good number of representatives of the other orders. In addition there are many very beautiful specimens of exotic Lepidoptera.

The Branch Associations connected with the Society are doing excellent work. They spread the knowledge of economic entomology to the great benefit of the farmers, horticulturists, and fruit-growers, in their several localities.

EVENING SESSION—THURSDAY, NOVEMBER 3RD, 1910.

A public meeting was held at 8 o'clock p.m. in the Massey Hall Auditorium, at which there was a good attendance of students and representatives of the College staff, as well as of members of the Society. The chair was taken by Mr. C. C. James, Deputy Minister of the Ontario Department of Agriculture. The proceedings were enlivened by some musical selections given by members of the College Philharmonic Society. After a few remarks by the Chairman congratulating the Society on reaching its forty-seventh annual meeting, and referring to the amount of good work that it has accomplished, he introduced the speaker of the evening, Professor James G. Needham, of Cornell University, Ithaca, N.Y., who occupies the chair of Limnology in the Department of Entomology. His subject was "The Role of Insects in Water-life," illustrated with many beautiful lantern pictures. The following is an abstract of his remarks:—

THE ROLE OF INSECTS IN WATER-LIFE.

PROF. JAMES G. NEEDHAM (*Abstract*).

Aquatic insects are not found in all the waters of the earth, but are mainly restricted to shoal parts of fresh water and to the shelter of rocks and vegetation. There are but few found inhabiting even the bottoms of our deeper lakes and streams, a few blood worms, caddis-worms and the burrowing nymphs of May-flies, and there is but one, *Corethra,* that is strictly free-swimming in habits and a constant denizen of the open water. Moreover, it is mainly the larval stages of insects that are aquatic; only these breathe by gills, and the larvæ are tied by parentage to the shores.

Alongshore, however, insects constitute a very important part of the submerged population, being present often in-inconceivably vast numbers. Sometimes a species, like the great May-fly, *Hexagenia,* that is synchronous in its habits of transformation, comes forth in swarms that darken the air on a midsummer evening, but the vast majority of aquatic insects are not thus concerted in habits and give us no visible demonstration of their abundance. Yet they abound in all aquatic situations in shoal water. Some groups, like the stone-flies, are fitted for life in rapid waters only, but most of the larger groups, like the flies and the beetles and the dragon-flies, contain representatives expressly adapted to situations of the utmost diversity. The rapid-water forms are usually flattened and depressed in body for attachment to the surface of stones where the water glides over them. And, on the other hand, those in stagnant waters usually possess devices for protecting their delicate gills from the accumulation of sediment.

The collector who knows something about the habits of the insects he gathers alongshore is usually struck with the apparent preponderance of carnivorous forms. All of the dragon-flies and bugs, nearly all of the beetles and the larvæ of many flies, are of strictly carnivorous habits and are very much more in evidence than the herbivorous May-flies or midge larvæ or those algæ-feeding beetle larvæ of the family Haliplidæ that has recently been demonstrated to be herbivorous.

The lecturer then showed many lantern slides illustrating species of May-flies, beetle larvæ and caddis-worms that are being studied especially at the Biological Field Station of Cornell University. He discussed the varying reproductive capacity, length of life, food and shelter requirements of these species, and showed in conclusion the possibilities of artificial increase by rearing in pure cultures and the possibilities of conservation of the natural supply of these excellent items of fish food by providing proper shelter and by protecting the foraging grounds.

The Chairman, Mr. C. C. James, expressed the pleasure that all present had derived from the address and the surprise that all shared in at the importance of aquatic insects as regards the provision of food for fishes. A vote of thanks to Prof. Needham was moved by President Creelman, seconded by Dr. C. Gordon Hewitt, and heartily adopted by the meeting.

SECOND DAY'S SESSION—FRIDAY, NOVEMBER 4TH, 1910.

The first portion of the morning was spent in the Society's part of the College Museum, and was devoted to an inspection of the extensive collections of Lepidoptera and Coleoptera and the specimens brought by the members. Among the various interesting examples presented may be mentioned a large collection of beetles captured upon foliage in illustration of Mr. F. J. A. Morris's paper; these specimens were beautifully mounted and carefully labelled. Prof. J. M. Swaine exhibited a series of specimens of Scolytid beetles and their work as wood-engravers and timber destroyers.

Dr. Hewitt exhibited a case containing the partial life-history of the Spruce Budworm (*Tortrix fumiferana*). This contained moths, larvæ, chrysalids, and several species of parasites, as well as drawings of the mature larva and end of twig showing the winter shelters of the young larvæ. In a separate case was exhibited the characteristic work of the caterpillars. Dr. Hewitt also placed on view a case containing the work of six different species of *Chermes* which had been donated to the Division of Entomology by Miss Edith M. Patch, of Orono, Maine, and specimens of the parasite, *Tropidopria conica*, reared from *Eristalis*.

Mr. Gibson exhibited a case containing rare Noctuids and Arctians. Among these were *Stretchia plusiiformis* and *Apantesis michabo* from Hymers, Ont.; *Momophara comstocki*, from McNab's Island, N.S.; *Sphinx perelegans*, from Wellington, B.C.; and a series of moths of the genus *Xylina* from the Ottawa district. An inflate of the mature larva of *Estigmene prima* was also shown, which had been reared from eggs obtained at Shawville, Que., by Mr. A. F. Winn.

The following were noted among the specimens exhibited by Mr. Lyman:—

Grapta gracilis, from the White Mountains.

Argynnis montinus, Chinobas semidea, Colias interior, Parchnobia wockei? and *Anarta schoenherri* from Mt. Washington.

Hepialus gracilis from the White Mountains.

Also the following from Hymers, Ont., received from Mr. Horace Dawson:—

A beautifully suffused specimen of *Argynnis atlantis*.

A curious completely suffused specimen of *Argynnis bellona.*

Phragmatobia assimilans, var. *franconia* Sloss.

Hyphoraia parthenos, the outer brown band on secondaries reduced to dots.

Graptolitha hemina. (This specimen was compared with Grote's type in the British Museum by Mr. Lyman and positively identified.)

Leucobrephos brephoides.

Cossus centerensis.

Cossus undosus?

Sthenopis argenteomaculatus.

Hepialus hyperboreus.

Dr. Walker exhibited a case containing the nymphs or larvæ of the following species of Canadian Aeshninae (a group of large dragon-flies): *Boyeria vinosa, B. grafiana, Basiaeschna janata, Nasiaeschna pentacantha, Anax junius, Aeshna juncea, eremita, interrupta (?), clepsydra, canadensis, palmata, umbrosa, constricta, californica and multicolor.* This includes all the known nymphs of North American species of Aeshna. He also showed an aberrant specimen of the butterfly *Charidryas nycteis* and the galls of three species of *Chermes* from black and white spruce in Ontario.

At eleven o'clock the election of officers for the year 1910-1911 was proceeded with and Dr. E. M. Walker was unanimously elected President and Dr. C. Gordon Hewitt Vice-President. The complete list is given on page 9.

The following resolution, moved by Mr. Henry H. Lyman and seconded by Mr. Arthur Gibson, was adopted:—

"That Past Presidents of the Society be invited to present to the Society framed photographs of themselves taken on a plate 10 by 8 inches with mat or border not over 3 inches wide, and that in the case of deceased Presidents the Council endeavour to have similar portraits prepared where photographs can be obtained for enlargement."

Professor J. M. Swaine, of Macdonald College, St. Anne de Belleville, P.Q., addressed the Society as follows:—

Mr. Chairman and gentlemen,—I have the honour this afternoon to represent officially the Quebec Society for the Protection of Plants. Two years ago, at a meeting at Macdonald College, we formed a society which we called The Quebec Society for the Protection of Plants from Insect Pests and Fungus Diseases. The name is rather long but it expresses very well our purpose. The Society receives financial assistance from the Quebec Government, and is thereby enabled to publish an annual report. Prof. Lochhead has been our President since the organization of the Society. We hold two meetings annually—a winter meeting, so far held at Macdonald College, at which papers are read, and business is transacted; and a summer meeting at La Trappe. This summer meeting lasts for two days and is devoted chiefly to collecting and discussions. La Trappe is an excellent collecting ground, and we have always a delightful outing among the beautiful orchards and vineyards and fine farms of those most hospitable gentlemen, the Trappist Fathers and Brothers.

Our members are few as yet, but we are ambitious, and hope to do something in the way of investigation and distribution among the Quebec farmers of a knowledge of the methods of controlling injurious fungi and insects which will justify our existence as a society.

I have then, sir, the privilege this afternoon of presenting to you and your Society the greetings and the good wishes of the Quebec Society for the Protection of Plants.

BEETLES FOUND ABOUT FOLIAGE.

F. J. A. MORRIS, TRINITY COLLEGE SCHOOL, PORT HOPE.

During my five years or more of collecting, I have captured, on and about foliage, species belonging to eight or ten of the great families of beetles. Some of these have been merely incidental and I know of nothing in their habits to connect them with the tree or herbaceous plant on which I found them. For instance, there is a species of Lagriid, a family closely related to the Tenebrionidæ or Darkling Beetles, which I have often taken on foliage—*Arthromacra œnea*; usually the beetle is found feeding in blossoms of the dogwood, occasionally on the foliage of that shrub, but quite often I have seen it on the leaves of the May-apple (*Podophyllum peltatum*), the New Jersey Tea (*Ceanothus americanus*), and the Sweet Fern (*Comptonia asplenifolia*); it appears to have a special fondness for this last shrub and on bright, hot days of July is often abundant in patches of Sweet Fern.

So far as I know it does not eat the leaves, but contrary to the general habit of the Tenebrionids it certainly courts bright sunshine. There is an allied genus in Great Britain (*Lagria hirta*) said to be found on blossoms and in hedges, which even in the larval stage is remarkable for its habit of wandering openly about foliage. Most of the Tenebrionid larvæ feed obscurely on vegetable matter, preferably in a dry condition; probably the best known, in domestic economy, is *Tenebrio molitor,* the famous meal-worm, which I have occasionally had served to me at breakfast in a plate of porridge.

There are three families of beetle in particular, many of whose members are extremely fond of sunshine. The Elaters or Click Beetles, their next of kin, the Buprestids or Metallic Wood-borers, and the Cerambycidæ or Long-horns.

I have often captured some of the smaller species of Elaters, chiefly of the genus Corymbites, resting on the upper side of leaves, apparently indulging in the luxury of a sun-bath. Early in May two seasons ago I took a magnificent specimen of *Buprestis striata* basking on the tip of a branch of white pine, and in August of the same year I saw darting about in the mid-day heat and settling from time to time on the foliage of a spruce the gorgeous little Buprestid, *Chrysobothris harrisii.* This dazzling vision in peacock blue was vouchsafed to me for a moment only and then withdrawn, but in my mind's eye I have been "following the gleam" ever since. Altogether that proved a red-letter day in my calendar, for I captured on the trunk of a newly-felled balsam fir at the same spot my sole specimen of *Monohammus marmorator.*

A great many of the Cerambycidæ or Long-horns are fond of this sun-basking; and I have made occasional captures on foliage of species that usually seek the shade: once a specimen of *Callidium antennatum* on a blade of grass by the road-side, and once a fine specimen of *Calloides nobilis* on a stalk of sedge by the rail-way track. But of those that are active by day, many of them feeding in blossoms, I have found many species on leaves, especially of the two tribes *Clytini* and *Lepturini;* in one or two cases, the insect seems to prefer one foliage to all others and perhaps such captures ought not to be regarded as merely incidental: for instance, I have found *Clytanthus ruricola* show a decided preference for the leaves of the thimbleberry, though it does not often feed in the blossom of this plant.

The capture I look back upon with greatest pride was that of a small specimen of *Eupogonius subarmatus* in my first season of collecting. I was going through a belt of basswood on the look out for various things, but chiefly "Walking Sticks" and the larvæ of *Chrysomela scalaris*; by "Walking Sticks" I mean the

Phasmid, *Diapheromera femorata,* an Orthopterous insect next of kin to the Praying Mantids; it occurred not infrequently that season about the Rideau on basswood; still more abundant on basswood leaves were the larvæ of *Chrysomela scalaris,* and I was rearing some in captivity. While scanning the underside of the foliage just above my head I noticed a leaf through which the sunlight passed imperfectly; there was a small opaque area near the centre, in short, something rather smaller than a house fly was casting its shadow on the upper surface. I drew the leaf cautiously down and surprised a diminutive longicorn sunning itself in the middle of the leaf; unfortunately, I surprised it in more senses than one, for, in response to a stimulus of self-preservation, it instantly collapsed and, tumbling down the leaf in a series of somersaults, like the clown in a pantomime, disappeared from the stage. For nearly half an hour I hunted among the *débris* at my feet and at last discovered the little harlequin playing 'possum under a twig.

At first I took this beetle for *Amphionycha flammata,* to which superficially it bears an extraordinary resemblance; but I found the ungues or claws (which are divaricate) simple instead of cleft; as they are distinctly cleft in *Amphionycha,* the foot appearing to end in four minute claws, it became certain my capture was *Eupogonius subarmatus.*

Another form of incidental capture is where beetles of a carnivorous habit resort to foliage in search of food. I have once taken *Calosoma scrutator,* and several times *Calosoma calidum* on the foliage of the white pine; these enterprising ground beetles poaching on the arboreal preserves for caterpillars; many of the diurnal fireflies, which are carnivorous, may be found resorting to foliage for the same purpose, and the *Coccinellidæ* or Lady-birds are regularly so taken. One July I found two or three species of Lady-bird resorting in large numbers to an asparagus bed where they were doing yeoman service in devouring larvæ as they fed on the foliage; on the *menu* of their banquet if not the *pièce de résistance* was *Crioceris asparagi,* and they were feasting royally.

Passing from incidental captures to those where the insect was found on its food-plant, I shall begin with an insect I saw in July three years ago which did not devour the leaves, but using its jaws as a pair of scissors, cut them and rolled them up into cylinders. I mean the weevil, *Attelabus analis,* the oakleaf roller.

I was examining the leaves of various plants, herbaceous and woody, along the railway track some 12 miles north of Port Hope—especially willow shrubs and oak-seedlings whose foliage was lush and tender, the leaves being, many of them, still pink and soft—when I noticed a curculio with black head and snout, the thorax and elytra of a shining chestnut red. I recognized it from having seen cabinet specimens as one of the oak-leaf rollers, and on diligent search I found it fairly abundant and always on young leaves, which no doubt proved more pliable and easily worked by this ingenious little artificer. It was not easy to see much work done, as the beetle is easily alarmed and drops from the leaf if approached too closely. I was able in one case, however, to watch the actual process of rolling and in another some of the preliminary work of cutting. Observations published in an American journal of entomology go to prove that though the act is instinctive and involves neither practice nor imitation, it is not absolutely perfect; leaves have been found cut in more than one place and then abandoned as unsatisfactory.

There is a very interesting account of a British leaf-roller (*Rhynchites betulæ*) given by Sharpe in the Cambridge Natural History. The female beetle goes to the margin of the leaf—at the base, but some way out from the stalk—and cuts through the leaf from the margin to the mid-rib somewhat in the shape of an upright letter S; it then crosses the mid-rib and cuts through the other half of the leaf to the margin somewhat in the shape of a prostrate letter S. The beetle then returns to the margin where it began cutting and, much as a grocer makes a paper funnel for sugar, rolls the edge over round an ideal axis till it brings it to the mid-rib; here it holds the funnel in position with the legs of one side while, with the other three, it draws the further side of the leaf towards it and wraps it around the part of the funnel already formed. When it finds the material stiff to work with it bites the surface of the leaf with its mandibles or pushes it into position with its feet, adjusting means to ends like a sailor at work in the shrouds furling canvas. It then enters the funnel, bites two or three small pits into the leaf, deposits an egg in each and then emerging completes the funnel by folding over and tucking in the tip of the leaf.

Mr. Sharpe, in comment, points out that the insect has never seen a funnel in its life and yet manages to make one perfectly the very first time of trying. But the author's perplexity is partly due to his confusing a purely instinctive act with an act of intelligence (*vide* the Peckhams' book on Wasps). How can an insect be a highly-skilled engineer, working with mathematical accuracy and on a scientific plan? It is an insoluble problem if you try to state your answer in terms of intelligence and individual consciousness. But place it among impulsive acts, involuntary and more or less mechanical, common to all members of the species, and you can give a fairly satisfactory explanation in terms of instinct.

Among insects especially are found instincts whose perfection is simply diabolical, often involving a highly complex series of acts performed but once in the whole life-time of the individual and therefore admitting of neither practice nor imitation. To look upon such acts as the result of conscious intelligence is absurd; the intellect has no place here and would be simply a meddler, likely to bungle and make a botch of the artificer's work. On the other hand a whole-hearted Darwinian like Weismann has no difficulty in applying his great principle of selection to such an act and seeing in it one more beautiful illustration of how all things living in the world, whether flora or fauna, are adapted to their environment.

As I have begun with one of the weevils, which come at the end of the Coleoptera in classification, I shall pass to a family not far removed from the weevils, the Blister Beetles (*Meloidæ*), many of which in the mature state occur abundantly on foliage and are very destructive. Four species of the genus *Epicauta* are known in Ontario; some of them occasionally attack the leaves of the potato, but more usually they feed harmlessly on flowers like golden rod and helianthus or the low herbage by river banks. I have not seen any of this genus and think it uncommon east of Toronto, or at least in the neighborhood of Port Hope. One species of an allied genus (*Macrobasis unicolor*), which also attacks the potato, I have found in great abundance about Port Sydney in low grounds feeding and breeding on the foliage of meadow-rue. The family consists of two tribes, *Cantharidae* and *Meloidae;* the former all have power of flight and are frequently found about foliage or flowers; in the latter the wings are abortive or entirely absent, and the beetle's most daring excursion into the realm of air consists in crawling up a grass-blade or the stem of some herbaceous plant. One or two species of *Meloe* or Oil-beetle are frequently found early in the spring and late in the summer, but the insect does not appear to eat foliage. Both tribes of this family are famous for their possession of a principle known as cantharidine, whence they are called Blister beetles, some of the species being of great medicinal value.

A more remarkable feature about them which they share with some of their neighbours, the *Mordellidæ,* is the phenomenon of hyper-metamorphosis. They are all parasitic in the larval stage, their hosts being usually bees, occasionally wasps and (in the case of *Epicauta*) locusts. The normal form of the larva is preceded by a very active louse-like insect known as a triungulin (each leg terminating in a triple set of hooks). The larva that suçceeds the triungulin is inactive and almost legless; moreover, in some cases the true pupa is preceded by a sort of preliminary pupal form from which emerges a larva of habit almost as active as the original triungulin, though it does not feed.

The triungulin is a monomaniac; I mean a creature of but one idea, one single goal of ambition, and its six active legs enable it to get there. The loadstone that draws the triungulin like a steel-filing to a magnet is the egg of its host. In the case of *Epicauta vittata* this is the egg cluster of a locust, and the parent beetle takes the precaution of laying its eggs near where the locust has hidden its egg-batches in the ground. Among the Cantharids whose host is a genus of bee (*Anthophora*), the beetle oviposits near the bees' nest, but in order that the triungulin may reach the egg of the bee, it has to be carried into the nest by a queen bee; its instinct impels it to seize the first hairy object within reach. This frequently proves to be the leg of a drone and in some cases the triungulin manages to transfer itself to the leg of a queen bee during the nuptial flight and so reaches its goal, the egg-cell in the hive. But hundreds of triungulins must perish from seizing a wrong object, and in order to compensate for this, selection has enormously increased the fertility of the female beetle, which lays as many as 2,000 eggs. In the *Meloe* or Oil-beetle the instinct is even more imperfect; the beetle does not lay her eggs near the home of the host and the triungulin mounts to the top of grass stems or enters a blossom and waits there for a hair (any hair will do); this more often than not proves to be growing on the leg of a fly, or if a bee, the wrong kind, and thousands of the triungulins, instinctively seizing the first hairy object that offers, are carried into space to perish miserably. All that saves the *Meloe* from utter extinction is the stupendous fecundity of the female, the clutch of eggs laid by this Apteryx among insects producing a brood of no fewer than 10,000 triungulin chicks.

Apart from the great Phytophagous group of beetles, easily the best known family of leaf-eaters is the Scarabæids. One section of this family consists of scavengers pure and simple, the larva being nourished in manure or rotting wood, and the female laying her eggs in such material. But an important branch of the family is phytophagous, the larvæ feeding on living vegetable matter, usually the roots of grasses and herbaceous plants, and the mature insects often feeding voraciously on leaves of trees or soft vegetable tissue.

In this family of beetles, structurally so different from the Phytophagous Beetles, strictly so called, it is interesting to note how far one group has diverged from another in response to conditions entailed by their chosen food material. Among the *Coprini* you find the larval stage completed in a few weeks or at most months, while the life of the mature beetle (as in Scarabæus) extends over a period of two or three years. Among the *Melolonthini* almost the converse obtains; the larva takes two, three or even five years to mature, and the beetle, after emerging from the ground, lives for only a week or two.

In Ontario the most familiar of these phytophagous scarabs are the leaf-chafers popularly known as June bugs. After three years passed in subterranean obscurity the beetles emerge, often in vast quantities; they are inactive during the day and remain hidden in the grass at the foot of trees or on the foliage itself, but at dusk they rouse up from their lairs and fly about among the trees in irregular flight, noisy and blundering: before midnight their activity on the wing ceases.

The life of the individual beetle after emerging from the ground lasts little more than a week or two, and you would naturally expect its chief concern to be the perpetuation of its kind.

But often Melolonthinus, like Launcelot Gobbo, is a huge feeder, sometimes entirely stripping fruit trees and ornamental shade trees of their foliage. There are one or two genera in this group containing species a good deal smaller than *Lachnosterna,* the true June bug, which are also very destructive in some parts and seasons. The Rose-chafer (*Macrodactylus subspinosus*), not content with eating the buds and petals of rose blossoms, frequently attacks the grape-vine and the foliage of various fruit trees; it is also sometimes a pest on young corn; it does not seem so far to have made its way east of Toronto in any serious numbers.

A closely allied genus is the *Dichelonycha,* one species of which (*D. elongata*) I have often seen eating the foliage of basswood. Three seasons ago it was very abundant in the woods near Port Hope, and responsible for a good deal of damage done in July to the foliage of forest trees; it shows a decided preference for basswood, eating its foliage more readily and more rapidly than other leaves, though I have found it on hawthorn and on maple.

Another genus, that of *Hoplia* (*trifasciata*), occurs often on hawthorn leaves, but it is almost entirely a pollen-feeder like *Trichius piger* and *Euphoria inda. Hoplia,* which occurs often on choke cherry, early elder and hawthorn, the males appearing at the beginning of May and the females a fortnight later, disappears at the beginning of June. Another species of *Euphoria,* a beautiful beetle, called *E. fulgida,* I suspect of eating forest leaves; I have picked it up several times under trees in open rocky hardwoods on the north shore of the Rideau.

Among Scarabs that frequent foliage are also two species very destructive in the tribe *Rutelini,* large handsome beetles—*Pelidnota punctata,* found on grapevines, and *Cotalpa lanigera,* chiefly on pear trees, but occasionally on elm, poplar and oak. I have never found this beetle, but the *Pelidnota* has been taken occasionally in the neighbourhood, usually on the cultivated grape-vine, but once or twice on wild vines, some miles north of the town; it does not appear to be at all frequent east of Toronto.

I mentioned at the outset of my paper the Buprestids as a family peculiarly fond of basking in the sun. There are two genera of Buprestid that eat leaves, *Agrilus* and *Brachys.* The first of these is a long, narrow beetle, taken occasionally on the leaves of basswood, but more common on the foliage of raspberries. The larva bores in the stem of the raspberry. A curious feature about the Agrilus is that in appearance and shape, as well as in some of its movements for escape or to elude observation, it closely resembles the longicorn beetle Oberea; moreover, the habits and life-history of the two beetles are almost identical; they both lay their eggs in raspberry stems, where the larva bores and feeds, and they both in maturity resort to the leaves of the plant as a resting place and occasionally for food.

The genus *Brachys* is a short form of beetle, almost as broad as it is long, the species I have most commonly found being *Brachys ærosa;* it is not uncommon on basswood and two or three other forest leaves, but I have usually found it feeding on the foliage of a hazel (*Corylus rostrata*), where it is sometimes abundant. It is stated in Sharpe's article on insects in the Cambridge Natural History that some of the smaller kinds of Buprestid have been discovered to feed on the parenchyma of leaves. I know nothing about the larval habit of *Brachys,* but arguing on analogy from *Agrilus,* I would hazard the guess that the larva is a leaf miner on hazel or other forest leaves.

In drawing a parallel between *Agrilus* and *Oberea* I referred to both form and habit. The form of *Brachys,* short and broad and somewhat flat, suggests the form of *Odontota,* a leaf-miner among the *Chrysomelians;* in habit, since the mature beetle of *Agrilus* responds to the same food-stimulus as its larva, the eating of hazel and other leaves by the *Brachys* beetle may mean that the larva mines in such leaves. (*Vide* Can. Ent., 1887, xix, 159.)

I have found a great many instances among the Coleoptera where the mature insect seems to be affected in a greater or less degree by the same stimulus as the larva. Perhaps the sight of the larva's food-plant strikes on some happy chord of childish recollection in the mature beetle.

To the student of animal instinct it is no doubt far more wonderful that an insect in its comparatively short life should at different stages respond to two quite distinct food-stimuli. The syrphus fly (*Eristalis tenax*), whose larva feeds in liquid manure, is at maturity a honey-sucking haunter of blossoms; in extreme cases, like that of the parasitic oil-beetles, as many as three distinct food-stimuli occur in the life of the individual.

But in my rambles through the realm of Coleoptera, it is the opposite phenomenon which has struck me most. I mean the number of beetles that are attracted to the food of their larva. I have noticed this especially among the Cerambycidæ. In many of them the smell of fermenting sap (where a tree is newly felled or has been injured by the lopping of branches or the mutilation of bark) seems to act as a direct and powerful stimulus in liberating the instinct of reproduction. This is specially noticeable in the Monohammi. In others, again, where perhaps the smell of sap has first drawn the insects to the tree for breeding purposes, the sight of the foliage seems to impel the beetles to eat the leaves. This is particularly the case in some genera that approach most nearly to the Chrysomelians. We have a familiar illustration of it in *Tetraopes,* the Milkweed beetle, whose larva feeds in the stem of the plant while the beetle resorts in large numbers to the leaves, on which it feeds freely as well as breeding. Less conspicuous examples of the same phenomenon are the *Oberea,* and still more the *Saperda.* I have several times captured *Saperda vestita* feeding on the sheaf of leafy twigs surrounding the basswood stumps, under whose bark the eggs are laid. I have found *Saperda moesta* eating the leaves of the poplar, where its larva develops, and on a single willow I once counted over 200 specimens of *Saperda concolor* breeding on the leaves and eating the foliage with evident relish.

These last few paragraphs have brought me right into the great group of Phytophagous beetles, properly so called; whose larvæ, without exception, find support on living vegetable tissue. They comprise three families, the Bruchids which devour seeds, the Cerambycids which attack the woody tissue of trees and shrubs, and the Chrysomelids which feed at all stages on foliage and the more succulent parts of vegetation.

The Bruchids form only a small group, and the genus *Bruchus* is the only one of much importance; besides the Pea and Bean Weevils (so called), the only species I have found at all abundant is a minute insect, *Bruchus discoideus,* sometimes plentiful in the blossoms of the white convolvulus or Morning Glory.

The Cerambycids appear to have been in their origin scavengers, rarely attacking sound wood; but the larvæ of many of them, before reaching full growth, eat right into solid timber; while others appear to eke out their existence by draining the afflux of sap to the part they have wounded; yet others again have deserted the forest tree that formed their ancestral home and taken up their abode in the fruit trees of our orchards. The larvæ develop slowly, and must greatly reduce the vitality of the tree they infest. They are exceedingly tenacious of life, and many instances are on record to show that the larval stage is capable of enormous extension.

The imago of *Monohammus* has been known to emerge from chairs and tables years after the manufacture of the furniture. Mr. C. O. Waterhouse, an English naturalist, heard one of these larvæ at work in a boot-tree (an implement for stretching top boots), which he had in his possession for 14 years; he then presented the implement to the Natural History Museum at Kensington, where for 6 or 7 years longer the larva continued to saw wood. The entire absence of sap had, of course, arrested the development of the larva, and it was unable to complete its transformation. Sereno Watson, the American botanist, relates another case (Packard, U. S. Ent. Comm., 1890, p. 689) that seems to prove the life of one longicorn to have lasted 45 years. When you add to this tenacity of life the larval obscurity which makes even detection difficult, it will be seen how serious a pest the longicorns may and often do become.

The Chrysomelians, on the other hand, live openly on foliage, which they devour as beetles no less than as larvæ. The larval stage is short, and the insect, as a rule, helpless and easily destroyed. They more than compensate, however, for their exposure to attack by their rapid breeding, many genera producing two broods every season. There are 11 tribes of the family in boreal America, all of them represented in Ontario. But the great bulk of our Chrysomelidæ belong to the four consecutive tribes—*Cryptocephalini, Eumolpini, Chrysomelini* and *Galerucini;* the last of these is far the greatest, and contains more genera and almost as many species as the other three combined. Together these four tribes contain more than two-thirds of the entire genera and species in the family.

As, geologically, the woody fibred vegetation preceded the leafy and succulent plants, it is probable that the Cerambycidæ attained their greatest development far earlier than the Chrysomelidæ. But the two families are undoubtedly closely akin, and the Donacias may be regarded both in form and in habit as in many respects intermediate between some of the less highly specialised genera of Cerambycids and the Chrysomelids.

THE POOL.

REV. THOMAS W. FYLES, D.C.L., HULL, QUE.

Within an easy distance of my present place of abode there is, in the landscape, an abrupt descent, clothed with forest trees, and extending for a considerable distance.

Such a descent would have been called in England, in the olden times, a "hanger."

In that delightful book, "White's Natural History of Selbourne," such a hanger is described; and the word itself is found in the names of places, such as Oakhanger, Westonhanger, etc.

It may be that the appellation is an Anglicised form of the Norman French *hangar*, a shed—a word common in Quebec Province, but almost obsolete in England. Thackeray, however, makes use of it in his "Life of Henry Esmond."*

At a spot under the elevation I have in mind, the Trenton limestone of the

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*"Mademoiselle, may we take your coach to town? I saw it in the hangar, and this poor Marquis must be dropping with sleep."—*The Hist. of Henry Esmond.* Bk. III., Ch. 13.

district crops out, around a hollow some yards across and always containing water. A projecting slab on the edge of the pool affords me a welcome place of rest. When I am seated upon it, my attention is naturally drawn to the creatures inhabiting the limpid water at my feet. I have found them a numerous and interesting assembly.

One day, early in June, I noticed a number of Newts (specimens of *Diemyctylus viridescens*), asprawl, and motionless on the bottom of the pool. Presently a small fly, either by accident or design, touched the water: immediately one of the newts, that had seemed so inert, rose to the surface and swallowed it. The propelling guiding powers of the newt were in its tail. A few undulations of this, and the creature ascended directly to its mark—its feet hanging motionless by its sides.

I much desired to examine the newt more closely; but how was I to secure it without injuring it? I called to mind that when I was a boy in England, I made a visit to friends in Surrey; and my young companions there took me to a pond to shew me how to catch "effets"—those formidable, saw-backed creatures that bear the name of *Triton cristatus*.

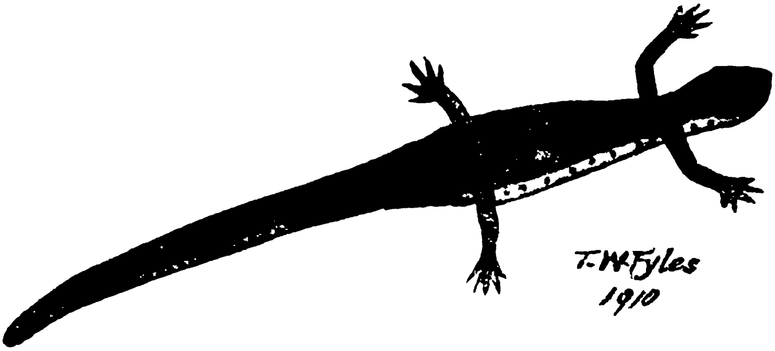

FIG. 1 *Diemyctylus viridescens.* Natural size.

My friends took with them a stick, a piece of string, and some worms. On reaching the pond they fastened one end of the string to the stick, and tied a worm by the middle to the other, and then dangled the bait before the eyes of a Triton. The little reptile seized it with the greatest avidity; and, so tenacious was its hold, that it allowed itself to be lifted from the water, and landed on the bank, without relaxing it.

I tried this plan with my newt; but it was a failure—the creature would not bite. It wriggled away. But a handsome Leopard Frog—cream-breasted, green-coated, and adorned with jet-black markings—which was sitting near with its head out of water—could not resist the lure, but swallowed it incontinently. I tightened the line to see if the frog would allow itself to be drawn from the water. It sat, as Mark Twain's "Jumping Frog" sat, after the shot had been poured into it; but it let the worm come from its maw with a slobbering gasp.

It may have been imagination, but I thought that a look of astonished disgust passed over the visage of the frog.

While I was considering how to secure a specimen of the newt, a mosquito lit upon my knee, and proceeded to present its little bill; but I brought a weighty argument to bear upon it, and put it out of occupation. I pitched its remains upon the water, expecting to see a newt rise to them; but instantly a hungry Water Strider (*Hygrotrechus remigis,* Say) seized them and glided away. At the same instant another newt rose to a fly. I had my Entomological net in my hand, and, on the impulse of the moment, I slid it into the water and caught the reptile.

What a beautiful little creature it was! Its back and sides were olive green; its under parts chrome yellow; and it was dotted all over, down to its toes, with jet black spots. In a row, on either side of its body, were some oval spots, crimson-lake in colour, and each inclosed by a black ring. Its tail, set edgeways, was broad and thin, and as long as its body. It moved with easy grace. I took the little creature home with me, made a drawing of it, and then carried it back to its companions in the pool.

The newts all disappeared at the end of July.

The Water Strider deserves our attention. It is a wonderful object. It stands and moves *upon* the water: its body does not touch the surface. Do you want a proof of this? It is before us. Notice on the rocky bottom of the pool, the little cluster of six black spots, that moves as the insect moves above. It is a group of shadows from the creature's feet. There is no shadow from its body—the light passing under it and the sheen on the water cut off that—but the feet, being in actual contact with the surface, cast their shadows below.

How can the Strider stand and walk upon the water? The length of its limbs, and the adjustment of its weight, enable it to do so.

A needle dropped lightly on still water will float; but a shot of the same weight will sink instantly.

If you place the living Strider upon water in a basin, it will at first dash about wildy, for it is possessed of an excess of energy; but, if you remain motionless, it will soon quiet down; and then, strange to say, you will easily perceive that at each foot the water is slightly depressed—the surface is not broken but bent in. The long legs of the insect stretch out like rays, and its body is suspended between them, distributing its weight to six points. It weighs barely one grain—I have had it carefully weighed by a chemist's scales—so one-sixth of a grain only impinges at one point upon the water (or one-fourth, when the insect is employing its front legs against its prey), but this is sufficient to cause a slight depression.

The dimensions of the Strider are as follows:—Length of body, 15 millimetres; breadth, at widest part, 5mm.; thickness, at thickest part, 3mm.; length of antennæ, 6mm.; length of proboscis, 3mm.

Front Legs: Length of femur, 5mm.; length of tibia, 3½mm.; length of tarsus, 2mm.

Middle Legs: Length of femur, 10mm.; length of tibia, 8mm.; length of tarsus, 4mm.

Hindmost Legs: Length of femur, 8mm.; length of tibia, 6mm.; length of tarsus, 2½mm.

These further particulars may be interesting:—The legs are densely clothed with short bristles—these, stretching backwards, must aid the creature's movements. The tarsi are two-jointed, and terminated with sharp claws. The antennæ have four long joints (that next the head being the longest), and a ring-joint between the second and third. The eyes are jet black, closely reticulated, and so prominent that they seem to be starting out of their sockets. The front legs are much stouter than the others and are formed for clasping—they are weapons of offence. The body beneath has the appearance of fine glossy leather.

The Striders are cannibals. I saw one of them leap upon a smaller relative, grapple fiercely with it, clasp it tightly to its chest, and then drive its proboscis into its body—the victim soon succumbed.

While sitting by the pool I learned, with other facts, that wasps resort to the water to drink. I do not think that this should occasion surprise, for the mastication of wood pulp, for the construction of their nests, must be thirsty work for the wasps.

At the edge of the pool some broken pieces of rock had fallen in, and a little water found its way between them. I saw a specimen of *Vespa diabolica,* Sauss, alight on the edge, walk down to the water, take a drink, and then fly away. Soon a second came to the same spot, and did likewise. Then there was a flash of brighter yellow; and a very bustling object came on the scene, and took the same course. I caught this insect to make sure of its identity—it was *Vespa germanica,* Fabricius. Soon afterwards a fourth insect, a specimen of *Polistes pallipes,* St. Farg., came to the same place for refreshment. No doubt all these wasps had nests not far away, and that this drinking-place was one of common resort for them.

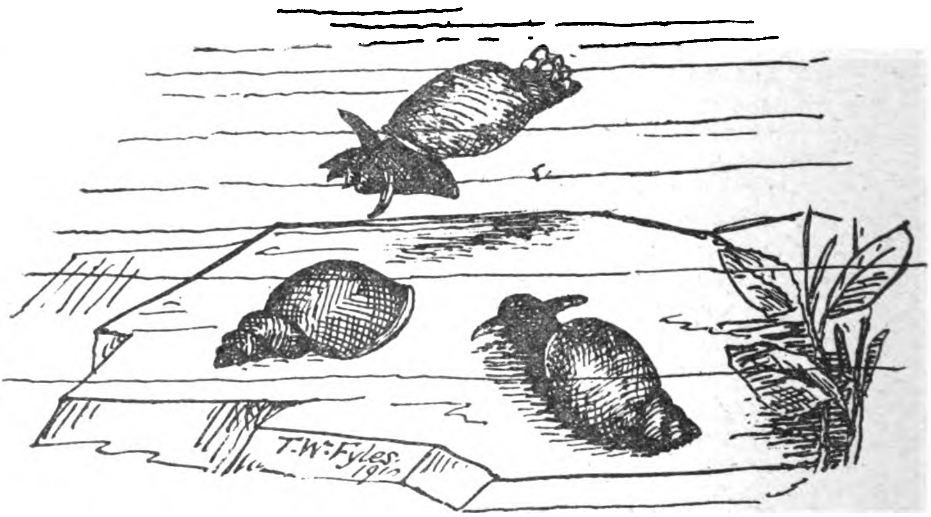

Fig. 2. Water Snails.

Another species of the wasp that frequented the pool was the Mud Wasp, *Pelopœus cementarius,* Drury. It came to gather material for the construction of its—we may well say—*orphanages.* These are built of mud, in snug nooks of houses, or other buildings. They consist of cells—each of about the capacity of a pea-nut—closely packed in masses which are smoothed on the outside. Before closing up a cell, the mother wasp fills it with spiders paralyzed by its sting, and drops a solitary egg amongst them. The mud castle contains no chamber for its builder—she soon dies.

Clinging to the rocky sides and bottom of the pool, I found a number of Water Snails, belonging to the genus Limnæa. Their shells appeared larger than those of *Limnœa palustris,* and not so large as those of *Limnœa stagnalis.* The snail itself was an ungainly object, dull black in colour, and with flat horns, the shape of brush-scythes. These probably aid the creature to steer its course in the water, when it loses its foothold.

Of Water Beetles three kinds were to be seen in the pool, viz.:—***Colymbetes sculptilis,*** Harris, *Dytiscus fasciventris,* Say, and *Acilius fraternus,* Harris. *Gyri-*

nus borealis, Aubé, which was very abundant in a neighbouring stream, was not to be seen in the pool.

On one of my last visits to the pool, I drew from the bottom of it a broken limb of a tree that had lain there, water-logged, for the whole season. Attached to the under surface of this piece of wood, I found a strip of some kind of spawn. It was three-quarters of an inch long and about three-sixteenths of an inch thick, and so firm that I was able to loosen it from the wood without damaging it. It was translucent, and I counted in it sixty minute eggs. I placed it in water, and shifted it to fresh water frequently. The jelly-like matter surrounding the eggs, whether designed to nourish or protect them, gradually dissolved, and the eggs became free. At this stage the embryo, curled round within the egg, could be easily seen with the naked eye. The eggs began to hatch in the beginning of the present month (November). This is a description of the larvæ in their first stage:—

Length, two millimetres. Translucent and colourless throughout—except that the tips of the mandibles were ochreous and the eyes were small brown dots. The head was large in proportion to the body. The antennæ were straight and tapering. The thoracic segments were slender, and angulated where the limbs were attached. The femora—especially of the hindmost pair of legs—were remarkably large. The segments of the somewhat enlarged and flask-shaped abdomen could be easily counted. At the end of the body were two respiratory tubes.

Were these the larvæ of *Dytiscus fasciventris,* Say?

On August 3rd an American Bittern (*Botaurus lengtiginosus*) flew up as I approached the pool. I think the bird was merely a passing visitor, for, in my frequent walks around the spot, I did not see it again.*

One day in September, while occupying my favourite seat by the pool, I became aware of a dozen heads protruding from the water, and a dozen pairs of eyes fixed intently upon me. The position struck me as ludicrous, and I laughed aloud. Immediately a dozen pairs of heels turned up with a splash, and my interviewers disappeared. In less than five minutes they showed themselves again, and resumed their watchful gaze, as much as to say, "What will you do next?" They were half-grown Leopard Frogs.

I made the acquaintance of these creatures early in May, when they were dirty-brown tadpoles, about the size of our hazel nuts, and possessing long tails. They developed hind-legs in the beginning of July, and, before the end of that month, had absorbed their tails, and become possessed of fore-legs.

About the time of their metamorphosis, the full-grown frogs disappeared from the pool: they were gone probably in search of land adventures; for their kind were plentiful in the low-lying meadows near.

Not the least interesting of the frequenters of the pool were the Dragon-flies.

The first of these to attract my attention was *Tetragoneura canis,* MacLachlan. I had not met with it previously, and am indebted to Dr. E. M. Walker for its identification. The following is a brief description of it:—

Tetragoneura canis, MacLachlan: Length of body 1⅝ inches; expanse of wings, 2 3-8 inches. Colour brown. Face and thorax hairy, with a white gloss. On either side of each segment of the abdomen there is a clay-yellow patch. Abdomen somewhat spatulate, widest in the middle, tapering towards the end. Venation of wings pale brownish red. Stigmata dark brown. At the base of the secondaries are some small brown blotches.

***On the 10th of June, 1904, I found a Bittern's nest containing three eggs, at the "Gomin," near Quebec. It was merely a depression in the herbage. The eggs were 1 7-8 inches long and 1 7-16 inches broad, of a pure oval, and fawn-coloured.**

In the course of the season the pool was visited by representatives of the five species undermentioned:—

Basiæschna janata, Say.
Libellula quadrimaculata, Linneus.
Libellula pulchella, Drury.
Plathemis trimaculata, De Geer.
Æshna umbrosa, E. M. Walker.

The last named was a particularly brilliant object. It was seemingly set with jewels. It flashed in the sunshine with the glories of emerald, sapphire, and topaz. It hovered over the pool, as a kestrel hovers over an English meadow.

The whole scene in the bright autumn days was very lovely. The Golden Rod grew thickly around, its colors relieved by the blue of the Michaelmas Daisy. Here and there a clump of the Glaucous Willow gave an air of seclusion to the spot; and a few yards away the stately forest trees ascended, with foliage already tinged with russet, crimson, and gold.

It was a spot in which the contemplative man might hold communion with his Maker, and muse upon all His works, and "rejoice in giving praise for the operations of His hands."

On October 17th—the day being bright and warm—I visited the pool again, but could detect no living thing within it. All its frequenters had lived out their lives, or sought their winter retreats.

The ground was covered with dead leaves, brown and sear; and silence reigned —"*Sic transit gloria mundi.*"

THE BEAN MAGGOT IN ONTARIO IN 1910.

J. E. Howitt, M.S.A., Ontario Agricultural College, Guelph.

It was the writer's privilege and pleasure to attend the inaugural meeting of the Bean Growers' Association of Kent County, at Ridgetown, in May. At this meeting the fungus diseases and insects injuring beans were discussed at some length. During the discussion many of the growers asked about a little white "weevil" which they claimed was their worst insect pest. Most of them had the idea that it was the bean weevil, but, from the descriptions given of it, the writer came to the conclusion that the pest was not the bean weevil. It was, however, impossible to say what the insect was from the accounts given by the growers at the meeting. An arrangement was, therefore, made for the Biological Department of the Ontario Agricultural College to investigate the insect and fungus diseases of beans which might become prevalent in Kent County during the summer of 1910.

About the 10th of June word was received at the College that "the little white weevil" was doing serious harm in Kent County. Many fields of beans had failed to germinate properly owing to the ravages of the pest. On June 21st the writer went down to Ridgetown, in Kent County, to investigate as fully as possible the cause of the trouble. At Ridgetown Mr. W. E. Galbraith, President of the Bean Growers' Association, met the writer and a start for a trip of inspection was made. The farm of Mr. Galbraith was first visited. On looking over the bean fields, here and there in the rows were seen plants which were little more than blackened stubs. The plumule and cotyledons had come above the ground, then withered and discolored. When some of these stubs were examined the cotyledons were seen to have little holes eaten in them, usually many holes in a single cotyledon, and very often the plumule had a little hole bored in it from above downwards for a short distance, less than one-sixth of an inch. It was quite evident that some insect had done the damage. Many of the other plants in the rows which were more advanced in growth were also noticed to be unhealthy and dying. The first pair of true leaves were limp and hanging down around the stem, instead of erect and spread out in their natural horizontal position. On digging up some of these plants a discolored hole was noticed in the stem usually just above the root, but sometimes in the root. When these stems were cut open they were found to have a little tunnel running up through the centre, and at the end of each tunnel a little white maggot was usually found. These maggots were evidently killing the plants by boring in the stems.

At the next farm visited a field was examined in which the beans had failed to germinate properly. Only a very few plants had come up in the rows and the owner was about to resow the field. The beans in this field had been planted just before a cold rainy spell lasting about three days. On uncovering some of the beans it was found that they were badly eaten by the same little white maggot that had been found in the stems. Half a dozen or more of the maggots were often found feeding upon a single bean. They were generally beneath the seed coat and between the cotyledons. Many more bean fields were examined and in all the maggots were found in greater or less numbers. Sometimes the seeds had been so badly eaten that they had failed to germinate, but in many instances though the cotyledons had been attacked by the maggots, the seed had germinated and pushed the damaged cotyledons above the ground and the plants appeared in the rows as discolored stubs. Though the maggots caused many blackish stubs in the rows and killed many of the more advanced plants by boring in the stems, the chief damage done by them was undoubtedly the destruction of the seed in the ground, making replanting necessary. The writer was informed that in some seasons many hundreds of acres had to be replanted on account of the work of the maggots.

While looking over one of the fields a large number of small flies were noticed hovering over and lighting on the bean plants. Suspicion was at once aroused that these these flies were the adults of the maggots. After some little trouble a number of them were captured and put on one side for closer examination than could be made in the field. At the same time a large number of the little white maggots, with the beans they were feeding on, were collected and placed in tin tubes and covered with a little moist earth.

The maggots were collected on June 21st, and on June 23rd, the day the writer returned to the College, they were all removed from the tubes. They had not apparently suffered from their journey, as they all seemed active and healthy. Two lots of the maggots and beans were put in large glass vials, the mouths of which were closed with plugs of cotton batting. A third lot was placed in a pot of moist sand in a breeding cage. On June 25th it was noticed that four or five of the maggots in the vials had pupated, and by June 27th practically all the maggots had transformed. On July 4th two flies emerged in one of the vials, and a week later it was found that flies had emerged from nearly all the pupæ, both in the vials and in the breeding cage. These flies appeared to be identical with those taken in the fields near Ridgetown. In order to make certain as to their identification some of the flies taken in the field and some of those bred in the vials were sent to Professor Coquillett of Washington, who identified both lots as *Pegomya fusciceps,* the adult of the seed corn or bean maggot.

The seed corn or bean maggot (*Pegomya fusciceps*) has been known for years as a destructive pest of seed corn and of beans. In the Entomological Society Report of 1900 Professor Lochhead mentions this pest among the insects of the year as doing serious harm to beans in Lambton County, Ontario. In Kent County, according to the reports received by the writer from the bean growers, it is by far the most serious insect pest of beans. Up to the present time the growers have apparently not known exactly what it was, nor have they had any exact knowledge of its life history, habits, or measures for its control. A brief account of these is, therefore, given here.

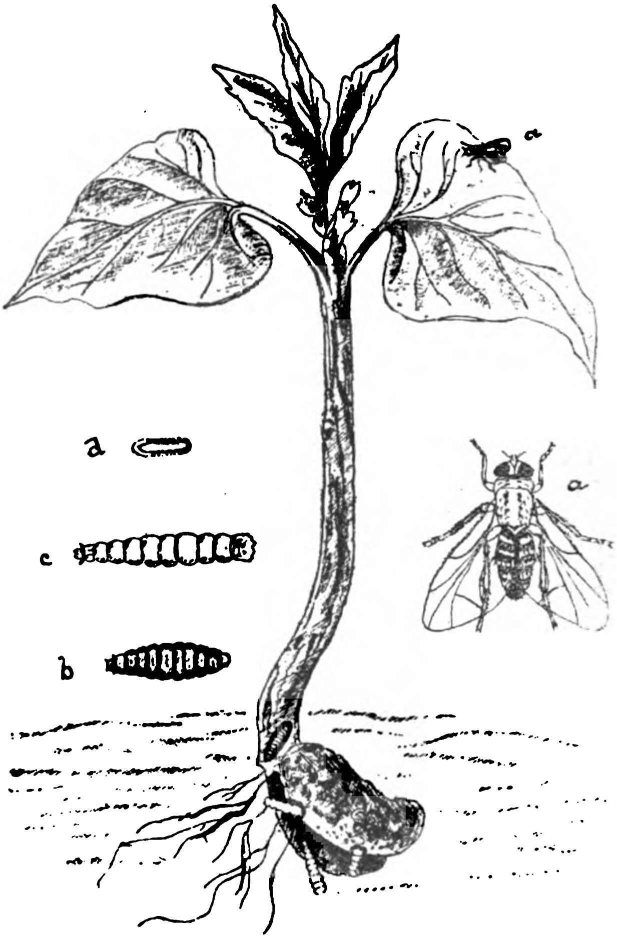

FIG. 3 The Bean-Fly—(*a*) adult fly, (*b*) pupa case, (*c*) maggot, (*d*) egg.—After Lugger.

DESCRIPTION.—The parent fly of the bean maggot looks very much like a small house fly. The maggots are white or yellowish white in color, footless, cylindrical in form, tapering towards the head, and about one-third of an inch in length. The puparia are light brown, barrel-shaped or elliptical in outline and about one-fourth of an inch in length.

LIFE-HISTORY.—It is thought that this insect passes the winter as the fly or pupa. In the spring the flies lay their eggs on decaying matter in the soil, and, when the maggots hatch, they find their way to the seed beans or seedling plants.

After the maggots cease feeding they change to the puparia from which the flies emerge in about two weeks. It is probable that there are two broods each season in the bean fields in Ontario.

MEANS FOR CONTROL.—While investigating this pest in Kent County the writer found that in every case where the maggot had done serious harm its presence in large numbers could be accounted for by one or other of the following conditions: Planting the seed just before a prolonged cold rainy spell, planting the seed too deeply, the heavy application of farmyard manure, or the neglect to follow the usual three years' rotation of crops. Means for control are, therefore, chiefly methods of prevention. Planting the beans at the right time and at the proper depth in order to insure a quick start seems to be one of the best means to prevent the ravages of this pest. Anything which retards germination, such as cold wet weather shortly after planting, or covering the seed too deeply, gives the maggots a chance to get started in the seed and to prevent its proper germination. As the eggs are deposited in decaying matter the application of farmyard manure increases their number, and the substitution of commercial fertilizers is often advised but not always practicable. If the maggot becomes very serious in a field, it will often be advisable to stop growing beans in that field for a number of years, in order to get rid of the pest.

THE HORSE-RADISH FLEA-BEETLE (*Phyllotreta armoraciae,* Koch).

A. F. WINN, WESTMOUNT, QUE.

About the middle of May last I purchased at Bonsecours Market, Montreal, a few roots of horse-radish, which I cut up and planted. In due course they began to put up their leaves.

Early in June, when the leaves were only four or five inches long, holes appeared, evidently the work of flea-beetles, but as it was the first time I had grown the plant, I did not know what species was likely to be the culprit. A glance showed the beetles in abundance, and also that they were something quite new to me.

They were about 3 mm. long, oval, and very convex. Head and prothorax black, elytra creamy white with a black sutural stripe, broadest in the middle, and a narrower black marginal line. Both prothorax and elytra dotted over with punctures. Many of the beetles were mating.

There was no difficulty in identifying the insects, as in Insect Life, Vol. vii., pgs. 404-406, 1895, there is an article by Mr. F. H. Chittenden giving an excellent figure and an account of its first captures in the U.S.A., at Chicago, Ill., and Guttenburg, Iowa. Whether this well-known European species has spread to the districts about Montreal overland eastward from Chicago, or whether we have had a direct immigration via the St. Lawrence route is a question, but not a very important one, as the fact remains that it has settled down in Canada, and will have to be entered among our insects injurious to vegetables. It seems remarkable that these little beetles could find my new plants so quickly and in such numbers. Doubtless someone within a few blocks of our house has been growing horse-radish, and has been harbouring a rather interesting beetle, perhaps for several years, all unknown to the Montreal Branch of the Entomological Society of Ontario.

Towards the end of June a plant of horse-radish was noticed by the roadside about a mile from my house, and on examination was also found to have its leaves riddled with holes, and scores of beetles were ready to hop off when approached too closely.

Although our common species of Phyllotreta, *P. vittata,* has a wide range of food plants among cruciferous plants both wild and cultivated, *P. armoraciæ* seems to have restricted itself to the horse-radish (*Nasturtium armoracia*) and marsh cress (*Nasturtium palustre*). If it should develop a liking for cabbage, it will be able to find an abundance of food in this part of the Island of Montreal. There was no sign of either eggs or larvæ on leaves or stems of the horse-radish plants at any time during the summer; if the larvæ attack the plants they must do it below ground among the roots.

THE MIGRATION OF SOME NATIVE LOCUSTS.

Norman Criddle, Treesbank, Manitoba.

We read from time to time, and have done so for many years past, of vast hordes of locusts darkening the sky, as they sweep onward from unknown breeding grounds. How they devastated the crops and ate up every living leaf in any locality they happened to make a stopping place, and in fact left behind a desolate and leafless waste where a few hours previous all had been luxury and beauty. Such is said to be the case, at times, in parts of Africa, India, and certain South American countries. There is, however, no longer any mystery connected with these visitations. Science has explained all that; has discovered the breeding grounds and is doing much to eliminate the injury by guarding against attacks and providing for them when they occur.

We are not, as a rule, apt to associate our common grasshoppers—many of which, however, are true locusts—with those devastating species. In fact of all our many different kinds we usually claim but one as truly migratory, namely the Rocky Mountain Locust, *Melanoplus spretis,* the locust made famous by having a special Commission appointed to investigate its ravages. This species in the past, has done immense damage to vegetation mostly in the United States, but it also invaded a great portion of Manitoba in the seventies, and is specially remembered on account of its having practically swept the Red River Valley clear of vegetation. Since then there have been two minor outbreaks confined to Southern Manitoba, the locusts having evidently flown from somewhere south. In spite of the prevalence of this species in Manitoba, at times, it is very doubtful whether it can be classed as a native, a distinction which, after all, we are not anxious for.

Leaving out *M. spretis* we have still several distructive species, foremost among them being the lesser Migratory Locust,*Melanoplus atlanis,* with several minor lights such as *M. gladstoni, M femur-rubrum, M. angustipennis, M. packardii, M. minor M. bivittatus* and others, all of which are very injurious at times and migrate regularly during the months of July and August.

It is a wonderful thing this migration. Few animals are free from a desire or instinctive stimulus to move to other parts and so spread the species. Plants, also, are constantly doing it by means of their seeds and those that cannot go far by their own exertions, fasten themselves to such as can, and so, as with ourselves, air, land and water are all made use of for the purpose of travel.

With regard to grasshoppers, it is strange that their regular periodic movements have been largely overlooked, though no doubt this is partly due to a lack of knowledge as to where to look. At Aweme, Man., where locusts have been troublesome of recent years, one instinctively looks up towards the sun, taking care to get behind some building, or in some way hide the sun's disc and then, if there are any flying, they will be easily observed within a radius of from one to fifteen diameters from the sun.

When a locust has the instinctive incentive to fly, it is said to inflate the air sacks along the side of its body; it then rises with a spiral movement, round and round, higher and higher, until reaching a height of some hundred feet or more and feeling the resistance of the wind it sails slowly away, usually flying with its head facing the breeze if it is at all strong, and gradually getting higher as it moves along with it until it becomes a mere speck of glistening whiteness, when close in line with the sun and invisible elsewhere. When there is no breeze it will return obliquely to earth to await a more favorable opportunity.

That this desire or instinct to fly elsewhere is no sudden impulse is shown by the fact that a locust when disturbed seldom flies any great distance and in fact seems incapable of doing so, while those that are prepared rise easily. Nor is the movement due to lack of food as one often sees them rise in the midst of plenty. No! it is Dame Nature's way of spreading her children over the country and she has taught them through the law of natural selection to go and also how to prepare for the journey.

The migratory season commences soon after the locusts reach maturity, that is when they have passed their final moult, and some three or four weeks before they commence laying eggs. It lasts almost a month. There is not, however, a continual movement, only hot sunny days are chosen and even then the locust is dependent on the wind which not only carries it along but indicates its direction also. The days most preferred are days when the breeze averages some fifteen miles an hour, though lesser winds as well as higher, are used to advantage; locusts seldom fly, however, when the wind is blowing hard.

It is interesting to watch these movements on a gusty day, when calm one moment and breezy the next. Then every fresh gust is taken advantage of and one sees hundreds of locusts rise on such occasions, as if having waited their opportunity. It is the same while looking up towards the sun, one moment will only discover a few, the next a perfect swarm moving at different angles owing to the breeze having slightly different directions at different heights, and so the journeys continue first east, then west, south or north as the wind varies. At night they apparently drop to earth * to infest new neighborhoods or perchance rise and move elsewhere next day. But not all go. Among the Orthoptera especially, nature has made a wise provision. Some are endowed with long wings; these are built especially for locomotion and conveying the insect long distances. Others of the same species have short or rudimentary wings which obliges them to stay at home. So that while the long-winged forms seek new homes, there are enough short-winged brothers and sisters to carry on the family at home and incidentally the work of destruction also.

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*It is well known that some grasshoppers travel throughout the night. Such an instance is related by Prof. S. J. Hunter of *Dissosteira longipennis*, and though I have no direct evidence, it is possible that some of the Manitoba species are also nocturnal during the migratory season.

SOME OBSERVATIONS ON THE PRACTICAL IMPORTANCE OF THE STUDY OF PARASITIC INSECTS.

C. Gordon Hewitt, D.Sc., Dominion Entomologist, Ottawa.

This subject of the practical significance of a study of the parasitic species of insects is becoming increasingly important each year, and my reasons for bringing the subject forward are chiefly two, first to reiterate the significance of this study; and secondly, to give an account of a little of the work that we have begun at Ottawa, some of which is a continuation of the work I was carrying on in England. We are all acquainted with the importance of parasitic insects in the natural control of serious outbreaks of injurious insects; so much so, in fact, that the sudden disappearance of an injurious insect which has attained very large proportions is not infrequently attributed to the work of parasites, upon the slightest, and often in the entire, absence of evidence in support of the supposition. Nevertheless we have a very large number of instances on record when such disappearances are due to the enormous increase of parasites. These sudden disappearances of serious outbreaks usually occur when man would be perfectly powerless and on that account, therefore, it is of great importance that we should study, so far as is possible, the course of such outbreaks, with the idea of learning the methods by which control is obtained and a balance regained in a state of nature. This is becoming increasingly necessary. Our own present methods of combatting insect attacks are comparatively inadequate. They are practicable only when the area attacked is not large, where the vegetation makes the expense entailed justifiable and where the insects have certain definite types of life-histories. But take an insect devastating a large area, as the Larch Sawfly has done in Canada in past years, no means could be adopted to control it, the area under attack was too large. Our cut-leaved birches are being killed by the Bronze Birch Borer, *Agrilus anxius,* nothing can be done at present on account of the peculiar life-history and habits of the insect. Many other instances may be quoted of cases similar to these where we are powerless at present to adopt practicable remedial measures. The reason for this is that we know so little. Our knowledge of the natural means of control, the parasitic insects and also the parasitic fungi which under natural conditions frequently obtain control, is still very meagre. One reason for this is, I think, that economic entomologists have been too much occupied in devising sprays and other mechanical means of attacking injurious insects, and the study of parasitic means of control, the natural means of control has been unduly, though on account of instances well-known to all, one cannot say entirely neglected.

The impossibility of using ordinary methods of insect control in the case of the Gipsy and Brown-tail Moths in Massachusetts has resulted in a great stimulus being given to the study of parasitic means of control and I firmly believe that the work now carried on under the Bureau of Entomology of the United States Department of Agriculture under the direction of Dr. Howard, who was responsible for its initiation, is the real beginning of the study and the practical applications of that study of parasitic and other natural means of control. This type of control will increase in importance as the importance of the conservation of our forests, for example, increases, as it is doing year by year.

During the last few years an interesting instance of the value of this kind of work occurred in connection with my investigations upon the Larch Sawfly, *Nematus erichsonii,* in England. I had the pleasure of bringing to your notice last year some of the results of this work and the different natural means of control which had been discovered were described.* The chief of these was the ichneumon, *Mesoleius aulicus,* Grav., which was found emerging from the cocoons about the same time as the adult sawflies were emerging. In the spring of 1908, during which year the defoliation of the larches was very serious, a beginning was made in studying the course of the chief factor in the natural means of control, namely *Mesoleius aulicus,* and the average number of cocoons parasitized by this insect in 1908 (strictly speaking one should say 1907, as 1908 is the year of their emergence from the hibernating larvæ,) was six per cent. In the following year, 1909, the percentage of ichneumons emerging had increased to twelve and fifteen per cent, showing that the parasites were increasing in number, though not very rapidly, and there did not appear to be any falling off in the abundance of the sawfly. In 1909, I relinquished charge of the English work on coming to Canada. As this investigation was of considerable interest to me and as I was continuing my study of the insect and its parasites, arrangements were made for a shipment of the cocoons collected in the English districts in which the investigations were previously carried on, to be sent to Canada. During the spring of this year the percentage of cocoons parasitized with *M. aulicus* was again counted and to my great pleasure and surprise I found that they had increased to over 60%. This was confirmed, in England, by Mr. J. Mangan, who continued the work on my departure; he found 62% parasitized. What was originally considered to be of theoretical importance only, is now seen to be of practical importance. We know that in about another year the sawflies will be practically controlled by the parasite in those localities so severely infested previously; where trees had been killed by repeated defoliation and the owners were cutting and contemplating cutting down immature timber to save it. This is now unnecessary and Mr. Mangan informs me that in those localities where the sawflies were so abundant previously it is almost impossible to find them. The trees which in previous years had all the appearnce of having been burnt, so complete was the defoliation, this year appeared almost normally green. Other localities, however, were more severely infested, and the Board of Agriculture, I understand, are adopting the recommendation in my paper to which reference has already been made, namely the collection of cocoons from localities where the percentage parasitized is very great and their distribution in localities where the outbreak is first beginning. In this way the practical application of natural means of control is made and we are able to assist nature in gaining this control and to hasten on the control far more rapidly than would be the case if affairs ran their natural course. This accelerating of natural eradicative measures will prevent also the loss of trees which occurs in the natural course of events. Several hundreds of the chief parasites *Mesoleius aulicus* which I reared at Ottawa were liberated there, and some were sent to Algonquin Park.

A further parasite of *N. erichsonii* and which appears to be abundant both in Canada and the United States is a small Chalcid, which Packard was the first to figure as *Pteromalus nematicida,* although he did not describe it. We found this parasite very abundant in some cocoons collected on the Experimental Farm, at Ottawa, in 1909. This year, through the kindness of Mr. Fiske, of the Gipsy Moth Parasite Laboratory, Melrose Highlands, Mass., I was able to secure a further supply of cocoons from Wellesley, Mass., infested with the same parasite, the life-history of which we are now studying, as I believe it is one of the most important natural means of control that we find. It is very easy to get them to oviposit under laba-

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*These have already been described in my paper, "The Large Larch Sawfly, *Nematus erichsonii,* Hartig." Journal Board of Agric. (London), Vol. XV., pp. 649-660. 1908.

tory conditions and as a comparatively large number of eggs are laid in each cocoon, it should be possible to breed this parasite in large numbers. This work is still in progress but I have a number of drawings of the parasite in different stages which may be of interest, and I think that one of the most important functions of these meetings is to report and discuss work that is being carried on, as such discussion is frequently of the greatest value to the investigator.

(Specimens and drawings were passed round.)

THE COCCIDÆ OF CANADA.

PROF. T. D. JARVIS, O. A. C., GUELPH.

Like a great many other families of minute insects the Coccidæ have been comparatively little studied in America, but to the fruit grower, forester, florist and others, the scale insects are of very great economic importance. Most of the species found in Canada have been introduced from other countries, only a few species being native to Canada. It is the imported species that give most trouble to agriculturists. It almost invariably occurs that when the balance of nature is disturbed, as is the case of introducing new form of life into a new country hitherto free from that form, unusual increase in numbers immediately follows. The habits of the Coccids are interesting and varied, and they are one of the most cosmopolitan insects known. They are found in the north as far as the 60th degree and equally as far south. In the tropics they are most at home, but when exported abroad they readily adapt themselves to nearly all conditions of temperature and climate. In some instances the spread is gradual, as in the San José; spreading northward the covering of the scale must undergo a thickening to protect it from the severer weather. Sometimes the spread is limited by the lack of suitable host plants, but in many cases, such as New York Plum Scale (*Eulecanium cerasifex*) the insect readily adapts itself to almost any kind of plant food, scarcely a tree, shrub or vine being immune. The writer has found many different species of herbs under badly infested trees literally covered with this pest.

A study of the habits of the Coccidæ furnish some very interesting phenomena of animal life. In Australia some species produce galls of all shapes and sizes on the eucalyptus trees. In Africa a large species found underground (*Margarodes*) are collected by the natives to make necklaces, bracelets, and other ornaments. Another species (*Tachardia lacca*) forms a useful product known as lac. The cochineal insect is noted for its commercial value as a dye, and numerous other scales are important from a commercial standpoint.

GALL-MAKERS.

Perhaps there is no more interesting species than those belonging to the genus *Brachysceles*, which are found in the land of anomalies, Australia. Mr. Claud Fuller, has published a bulletin on Gall-making Coccids in which he describes the galls as follows:—

"*Galls of the Male Coccid.*—These are invariably short cylindrical tubes, two to six inches in length, generally growing upon the leaves; they are mostly of a purple claret colour, but often brown or green. Some are simple tubes with a notched rim at the summit, others have the rim dilated forming a saucer-like top. The male gall of *B. rugosa,* Froggatt, is emerald green, cylindrical, constricted at the base, stout with thick, soft walls, the apex truncate; length, four lines; breadth one line. In several species these male galls grow upon the female gall; *B. munita,* Shrader, has the males separate and springing from the horns; in *B. phratrata,* Shr., *B. thorntoni,* Frogg., and *B. nux,* they are congregated together in a cup-like growth. This growth expands like a flower, and is, I am afraid, rather inaptly described by Shrader as a cockscomb, and as a mushroom-like growth by Froggatt. There is generally only one cup-growth attached to a female gall, but *B. nux,* as a rule, has two and often three. They are attached at one side of the summit of the female gall, which they often exceed several times in size.

The Female Galls exhibit a great variety of forms, which are the easiest means of distinguishing the different species, varying in size from one-half to six or seven inches in length. In the shape there is as great a variety as in the size; many of them resemble cone-like fruits, others nuts and fruits, whilst the lateral growths of *B. duplex* are not unlike leaves. Occasionally growing on stalks, they more often sit close upon either the twigs, branches, or leaves, from which they spring.

The Formation of Galls.—The number of various gall-making insects which have the remarkable power of diverting the forces of nature, as represented in the growth of a plant, to their own advantage, has given rise to a deal of speculation and experiment to discover the inherent element of property possessed by the insect by means of which it operates. Up to the present we can go no further than to say that the galls are due to an irritation set up by the insect, yet each individual species must have some peculiar properties or how would we find such widely differing results when in their initial stages the producers are as alike as the two proverbial peas? Mr. Tepper asserts that the larvæ always select an embryo-bud, and by the context he evidently wishes an undeveloped but true bud to be understood. This, is, however, not the case; it may hold good in some instances, but certainly not in all. Whether upon stem or leaves the gall-growth originates from the cambium ring; the developmental activity of the cells is released by the insect, and a shoot forms over the growth of which the animal maintains direction. This is proved by the cessation of growth when the coccus, in a young stage, is killed by parasites.

The rudimentary gall, according to Dr. Alder, draws its nourishment from the surrounding tissue; later on, however, processes are driven into the gall from the spiral vessels of the cambium ring, which form a new element to assist in its development, and it thus becomes an independent structure, having individual powers which regulate its shape, position, etc. These remarks, whilst referring to galls formed by wasps, apply equally to coccid galls."

SECRETIONS.

One of the main characteristics of the Coccidæ is their habits of secretion. Like the Aphids the insects secrete a sweetish substance known as honeydew, which is the sole food of several species of fungi and the chief food of many species of Ants. This fluid is excreted entirely by the females by a special organ, a cylindrical tube exserted from the genital orifice after the manner of the telescope. Honeydew is attractive to many other nectar feeding insects besides the ants, such as the Hive Bee and Bumble Bee and many species of Wasps.

A species known as *Physokermes abietis* found at Guelph, gives off a wax-like secretion which is collected and used by the Hive Bees in constructing their cells. This species is very abundant on Norway Spruce, and although causing considerable harm in the tree is very beneficial to the bee in supplying material for the foundation of its cells.

Another species, *Ericerus pela,* secretes a pure white wax, which in China is collected and made into candles for special use. In India similar use is also made of a wax obtained from a species of *Ceroplastes ceriferus.*

In India a species known as the Lac insect (*Tachardia lacca*) furnishes us with the useful product known as lac, which forms a basis for varnish, French polish and other important products. It is collected in its native home, India or Ceylon, and sent abroad on the twigs and branches upon which the insect has worked and deposited the substance. This raw material is then subjected to a process of refining by which the material is gathered in the form of shell-lac and is then ready for use. It may be interesting here to offer a brief life history of the insect itself which produces this very valuable material. Mr. Robert Newstead, quoting from the Royal Horticultural Journal in his work on the Coccidæ of the British Isles, writes as follows on the species:—

"Like all other Coccids, the young (larvæ) are active; they are at first very tiny creatures, resembling mites, and are generally spoken of by the horticulturist as 'lice.' These young arrange themselves in groups of various dimensions round the twigs of the food-plant, and, having settled matters satisfactorily as to space, insert their thread-like sucking-tube (mouth), into the plant tissues, and pump up the sap of the tree. At the same time they commence covering their bodies with the peculiar 'lac' which, by the time they are fully developed adult females, assumes the form and size shown in the illustration. By taking a hot knife a transverse section of the material may easily be made, when it will be seen that the covering material or 'lac' is not a solid mass, but is honeycombed by large, somewhat ellipsoidal cells, each of which was once tenanted by a single female . . . If we examine a female we find she is shaped somewhat like the cavity in which she lives, with the cephalic portion bearing the mouth parts touching the bark at the narrow end of the cavity, and the abdominal extremity at the opposite end, having connection with the exterior by means of a minute perforation; and she is destitute of legs antennæ, etc. Where she has lived she dies, leaving as a legacy the wonderful product which she manufactured during life, and which all the world over is of so great importance in commerce. And this is not all; the bodies of the females also furnish an excellent dye, which in former times was of much value also."

DISSEMINATION.

The female scale is wingless, hence they must be borne from place to place by agencies outside themselves, such as wind, water, plants and animals. It is very noticeable that with such scales as the San José the spread is always greatest in the direction of the prevailing winds. This, however, is possible only when the insects are in the active moving stage; as soon as they come to rest and attach themselves to their host no further spread occurs in this way. Rain too is supposed to help spread the scale when they are in the egg or young active stage, by washing them from the upper to the lower parts of the trees, but it is animals that effect the greatest dissemination from tree to tree. Birds frequenting orchards and forest trees undoubtedly carry numbers of scale insects attached to their feet and beak. A very wide distribution may occur in this way, even across bodies of water or mountain ranges. The insects and Acarids also assist in the local distribution of the scales. Lady Bird beetles and Ants among the insects and the predaceous species of mites are responsible for a great deal of the spread of the injurious scales. Another probable factor in distributing scale insects is the careless handling of the infected fruits, such as apples and pears. Refuse fruit is often allowed to come in contact with unaffected trees and thus cause the free plants to become infested. The spread from one province or country to another is due almost entirely to the interchange of plants by nurserymen and florists. There is always the possibility of introducing scale wherever a shipment of shrubs or trees is made from one place to another. If the trees can adapt themselves to the new environment and become thrifty under the new condition, there is hardly any question about the scale surviving. In nearly all cases the scale undergoes the change without any apparent inconvenience.

NATURE OF THE INJURIES.

As nearly all scales derive their nourishment from the juices of the plant it is evident that a considerable weakening in its vitality must result. When only a few insects are present as we found on trees attacked by our native species, there seems to be very little injury to the tree, but when swarms of these occur in the case of the imported species the health of the tree is so impaired that in some cases death occurs. In cases where the trees do not actually die, but are rendered weak, a corresponding weakening is shown in the quality and quantity of the fruit. Some of the characteristics of the injury are seen in discolorations of the leaves and tissues, malformed and discolored fruit, and to some extent early maturing and falling of the leaves.

LIFE-HISTORY.

Most of the Homoptera have incomplete metamorphosis, but in the Coccidae only the females have incomplete metamorphosis; the males pass through the four stages. The eggs are seldom laid in exposed situations as is the case in their allies, the Aphids and Aleyrodids, but various means are provided for their protection from predaceous animals and from the weather. The Cottony Maple Scale lay their eggs in sacks formed of a cottony-like substance, which surrounds them. Others, such as *Physokermes abietis,* are deposited in a very peculiar pouch-like organ formed by the folding in of the outer epidermis. In Orthezia the female carries the eggs between the long waxen plates at the posterior extremity of the body. The most common color of the egg is yellow or pink, but a few are crimson, such as that of *Chionaspis salicis* and in some species of *Paralatoria* they are dark mauve. The number of eggs laid by an individual varies from 25 to two or three hundred.

The larvae, upon hatching, in the majority of species, remain for a few days within the covering provided for them. Soon they leave this house and become quite active, seeking the new and tender tissues, where in most cases they settle down and immediately insert their long sucking apparatus into the tissues, and in the case of the female, remain stationary until death.

The pupal stage occurs only in the males. After a few days of active larval life they withdraw their tubes and undergo marked changes characteristic only of the Coccidae.

Most of the adult males being destitute of mouth parts live only a few hours, or at most a few days.

The female adult is characterized by the absence of wings and by its well developed mouth parts. They are usually flat and pyriform in shape and covered with scales made from the secretions of their bodies. There are sometimes one and sometimes several generations in a season.

CHARACTERISTICS AND CLASSIFICATION.

The Coccids belong to the order Hemiptera and to the suborder Homoptera, which includes the Aleyrodidae, Psyllidæ Jassidæ, Membracidæ, Aphididæ and Cicadidæ. These females bear a striking resemblance to each other, which is especially noticeable in the immature stages of development. The larvæ of the Aleyrodidæ are often mistaken for the female adult scale insect. Among the Aphididæ, *Ceratophis lintaniæ* is frequently mistaken for a Coccid and is known by horticulturists as the "black seed scale." All the insects of this order have sucking mouth parts, and with few exceptions, incomplete metamorphosis. In the larval stages the male and female bear a close resemblance to each other, but in the adult stages they are readily recognized. In the female the wings are always absent; the metamorphosis is incomplete, with a mouth or rostrum placed on the ventral surface. In the male the metamorphosis is complete, the mouth is obsolete, usually a pair of wings, the posterior pair represented by a pair of halteres.

ORTHEZIINÆ.

90. *Orthezia americana* (Walk.). This scale has been found at Grimsby, Ontario, on Golden Rod; at Woodstock, Ontario, on Ragweed. It has also been recorded by Dr. Fletcher at Ottawa, and several places in Quebec.

98. *Orthezia insignis* (Dougl.). This species was first found at the Fruit, Flower and Honey Show, Toronto, in 1906. It was next seen in the conservatories at Guelph in 1907, and since that time the writer has collected it in many parts of Ontario.

103. *Orthezia occidentalis* (Dougl.). This interesting and beautiful species was found by J. Wm. Cockle, Kaslo, B. C., on roots of grass and trees amongst rotten wood. He remarks that he has found them in great numbers on several occasions on the roots of apple trees, which had grown wild amongst a pile of chips. The specimens were identified by Prof. J. G. Sanders of Washington.

DACTYLOPIINÆ.

192. *Asterolecanium variolosum* (Ratz). This species was found by Dr. Fletcher in 1900, on young oak trees at Ottawa, Canada, which were set out in 1895, and came from a nursery in Pennsylvania. It has been found destructive to oaks at Niagara Falls, Ontario.

242. *Kermes galliformis* (Riley). These scales occur either singly or in clusters on the twigs and branches of Red Oak (*Quercus rubra*). It is beautifully variegated with yellowish, gray and black, and nearly always accompanied by a Lepidopterous parasite. It is found all through the Niagara District, in the city of Toronto, and to some extent in the south-western corner of the Province.

254. *Kermes pettiti* (Ehrh). This species was first found at Jubilee Point on Rice Lake, near Peterborough, Ontario, by Dr. Fletcher, in 1899. The writer has found this species at Guelph, Toronto, Ottawa, and other places in Ontario. It is very common and has a wide range in Ontario.

255. *Kermes pubescens* (Bogue). The writer has found this species on oak at Guelph, Toronto and Perth, Ontario, and is probably wide spread over the Province. It was found abundant on each infested tree and undoubtedly does considerable injury. It is usually found in the cracks of the bark on the trunk and branches.

279. *Gossyparia spuria* (Moden). This species was found attacking a few Elm trees in the city of Toronto in 1906, and since that time it has spread to nearly all parts of Toronto and has proven to be a very destructive pest.

293. *Eriococcus borealis* (Ckll.). This is a native species found on Willow (*Salix*) at Dawson City, 64 degrees North Lat., by Mr. John Morley, in 1899. As far as I am aware this species has not been found in any other locality.

391. *Phenacoccus aceris* (Sign.). It has been received from Amherstburg and St. Catharines, Ontario. So far it has confined its attacks to the Soft Maple (*Acer saccharinum*). *Several* trees were badly attacked by this scale and the writer ordered the destruction of the infested trees.

401. *Phenacoccus dearnessi* (King). This species was found by John Dearness on Hawthorne (*Crataegus sp.*) at London, Ontario.

454. *Pseudococcus citri* (Risso). It is found in conservatories on many species of plant throughout Canada. Closely related species or varieties are found on the Apple and other Rosaceous plants in the open, at Guelph and Toronto, Ontario.

490. *Pseudococcus longispinus* (Targ.). Very abundant on many species of indoor plants in all parts of the Dominion.

529. *Pseudococcus trifolii* (Forbes). The writer found this species very abundant on the roots of cultivated clover at Collingwood, Ontario.

572. *Ripersia lasii* (Ckll.). This species was found in Ants' nest (*Lasius americanus*) at Toronto, Canada, in 1897, by Mr. R. J. Crew. The writer has found this species in Ants' nest at Guelph, Ontario.

COCCINÆ.

661. *Pulvinaria floccifera* (Westw.). This species was found in a greenhouse at Ottawa, Canada, December 15, 1894, on leaves of *Brassia verrucosa.* King described this as a separate species, *P. brassiae.*

675. *Pulvinaria occidentalis* (Ckll.). This species was found infesting in a serious manner a whole plantation of Red and White Currant at Chilliwack, British Columbia, by Rev. G. W. Taylor, in the spring of 1899. In July (the same year) Dr. Fletcher visited the plantation and found these scales to be in enormous numbers, the white flocculent threads giving the bushes the same appearance as if a light fall of snow were upon them. It has also been found by Dr. Mackay, June 14, 1901, on Gooseberry bushes at Dartmouth, Nova Scotia.

699. *Pulvinaria vitis* (Linn.).—*P. innumerabilis* (Rathvon)—*P. tiliæ* (King and Ckll.)—*P. viburni* (King). This species is commonly known as the Cottony Maple Scale and is found all over the Western part of the Province at least, and also in the woods at Aylmer in the Province of Quebec, nine miles from Ottawa. As the name indicates it attacks the Maple chiefly, and in cities often does much damage to maple shade trees. It is, however, rarely abundant for many seasons in succession, because of the attacks of parasites. Although the maple trees are the ones most commonly attacked, the scale is found on many other trees and shrubs as well. It has been found at Guelph on *Acer saccharum, A. saccharinum, A. nigrum, A. rubrum,* and *A. negundo, Tilia americana, Ulmus americana, Crataegus sp., Populus alba, Salix sp., Cornus stolonifera, Ilex verticillata, Spiræa salicifolia,* and *Vitis cordifolia.*

724. *Eriopeltis festucæ* (Fonse). The Cottony Grass Scale was found by Mr. A. H. Mackay, on grass in large numbers in Cumberland Co., Nova Scotia, in 1889. It has occurred in conspicuous numbers several times in Nova Scotia and

New Brunswick. This species has been recorded at Ottawa, Ontario, but Dr. Fletcher says, it was a mistake and, if so, we have no record of this species in Ontario.

848. *Coccus hesperidum* (Linn.). Commonly known as the Soft Scale, is found abundantly in conservatories in Oleander, Orange, Lemon, etc., in all the provinces of the Dominion.

860. *Coccus pseudohesperidum* (Ckll.). This is a very large species found on Orchids in the conservatories at Guelph and Ottawa. It is usually most abundant on *Cattleya sp.* These are the only records for this species. Its nativity is unknown.

902. *Toumeyella pini* (King). This species was found by Mr. J. Dearness on Austrian Pine (Pinus austriaca), at London, Ontario.

902b. *Toumeyella liriodendri* (Gmel.). This species was first reported by Dr. Fletcher on Tulip at Ottawa, Ontario.

911. *Eulecanium persicæ* (Craw).—Fab. 1.—*E. armeniacum*). In Mr. King's account of the scales of British North America he reports this species infesting orchards at Sherbrooke, Quebec, in 1899. This species has also been reported from Prince Edward Island.

918. *Eulecanium caryæ* (Fitch). This species is said to be the largest known species of Eulecanium. It has been in Ontario for at least 12 years, having been first found by Dr. Fletcher in the Niagara district in 1898. Judging from the fact that it has been found in that district on Peach trees and that we have found it plentiful on forest trees at Guelph, it probably occurs at least all over the south-western part of Ontario. The scale is seldom sufficiently injurious enough to cause any alarm. It has been found on *Crataegus sp.; Ulmus americana; Ulmus racemosa; Ostrya virginica; Carpinus caroliniana* at Guelph, Ontario, and on the Peach (*Prunus persica*) at St. Catharines, Ontario. It has also been reported from Nova Scotia on forest trees. It is usually accompanied with parasites in Ontario.

921. *Eulecanium cerasifex* (Fitch).—*E. canadense* (Ckll.); *E. caryarum* (Ckll.); *N. corylifex* (Fitch); *E. cynosbati* (Fitch); *E. fraxini,* (King); *E. guignardi* (King); *E. juglandis* (Bouche); *E. maclurarum* (Ckll.); *E. websteri* (Ckll. and King); *E. fitchii* (Lign); *C. pruinosum* (Cqul.). The New York Plum Scale has become the most common scale in Ontario and Quebec. The writer has found this scale on a great range of trees, shrubs, vines and herbs, the following being a list of those so far recorded: *Acer nigra, Acer saccharum, Acer saccharinum, Acer spicatum, Acer negundo,* and many varieties of the above mentioned species, *Aesculus hippocastanum, Staphylea trifolia, Rhamnis cathartica, Psedera quinquefolia, Vitis cordifolia, Tilia americana, Tilia europea, Carya ovata, Carya glabra, Corylus americana, Ostrya virginiana, Carpinus caroliniana, Betula lenta, Betula lutea, Alnus incana, Fagus grandifolia, Castanea dentata, Quercus robur, Quercus macrocarpa, Quercus rubra, Quercus coccinea, Ulmus americana, Ulmus campestris, Ulmus fulva, Ulmus racemosa, Celtis occidentalis, Juglans nigra, Juglans cinerea, Salix sp., Populus alba, Populus tremuloides, P. balsamifera, Populus deltoides, Crataegus sp., Rubus occidentalis, Rubus strigosus, Prunus serotina, Prunus virginiana, Prunus nigra, Prunus persica, Pyrus malus, Pyrus japonica, Pyrus communis, Amelanchier canadensis, Sambucus canadensis, Sambucus racemosa, Ribes nigrum, Ribes vulgare, Hamamelis virginiana, Ribes cynosbati, Cornus stolonifera, zanthoxylum americanum.* In addition to these many species of herbs near infested trees. It is spread over practically the whole of Ontario and the eastern provinces. Though not so destructive as the Oyster Shell Scale, it is often quite injurious where abundant and sometimes kills the infested tree.

935. *Eulecanium fletcheri* (Ckll.).—*E. pallidor* (Ckll. and King). In 1907, the writer found this species on White Cedar at Guelph. It was originally described from specimens found by Dr. Fletcher abundant on a hedge of *Arbor vitæ* and on trees of the same species at Stittsville, Ontario, fifteen miles from Ottawa. This species is nearly always parasitized by a Chalcid. In 1908, *E. fletcheri* was found on the Red Cedar (*Juniperus virginiana*) at Guelph and Hamilton, Ontario.

946. *Eulecanium lymani* (King). Recorded by Mr. King on a young Oak at Quebec city and North Hatley, Quebec. This may be the same as *E. cerasifex.*

950. *Eulecanium nigrofasciatum* (Perg.). This strikingly marked species has been received from Walkerville on Soft Maple and on Peach at St. Catharines, Ontario. In both cases the trees were badly infested and no parasites were found. As far as I am aware it has not spread to any other parts of the Province.

958. *Eulecanium pyri* (Schr.). King records this species on Apple trees in Prince Edward Island.

959. *Eulecanium quercifex* (Fitch).—*E. quercitronis* (Fitch); *E. antennatum var.* (Ckll.). This species occurs on Oak (*Quercus coccinea*) at Ottawa, Ontario and on Oak (*Quercus rubra*) from Jubilee Point, Rice Lake, Ontario.

965. *Eulecanium rosæ* (King). Recorded by Mr. King in his account of the Scales of British North America. I have not found *E. cerasifex* on any cultivated or wild species of rose. The species was found in Rosebush at Sherbrooke, Quebec.

974. *Eulecanium vini* (Bouche). This species has been found by the writer on Grape vines in the Niagara district and to some extent on Grape vines in the City of Toronto. Mr. King received specimens from Dr. Fletcher at Ottawa, on *Spiraea salicifolia.* These scales have in all probability been imported on nursery stock from Germany.

993. *Saissetia hemisphæricum* (Targ.). It is a very common scale in conservatories in all the Provinces. Its favorite hosts are Oleander, Cocos, Sago Palm, Croton and Orchids.

1008. *Physokermes piceæ* (Schr.). The Spruce Physokermes was found attacking the Norway Spruce on the College grounds at Guelph. The domesticated bees collected wax from this species. This species has been reported from one or two other parts of Ontario.

DIASPINÆ.

1036. *Chionaspis americana* (Johnson). This species was found on American Elm (*Ulmus americana*) at Guelph.

1055. *Chionaspis furfura* (Fitch). The Scurfy Scale, though widely distributed through Ontario and the Eastern Provinces, is seldom found in so great abundance as the Oyster Shell. Badly infested trees or other plants are very much weakened and not infrequently killed as a result. Many kinds of trees and shrubs are attacked by this scale, but the most common are the Apple, Mountain Ash, Japan Quince, Horse Chestnut, Hawthorn, White Ash, Currant and Gooseberry.

1062. *Chionaspis lintneri* (Comstock) is found at Guelph on Alder (*Alnus incana*) ,Dogwood (*Cornus stolonifera*). It has been received from Ottawa and Rondeau in Ontario.

1073. *Chionaspis pinifoliæ* (Fitch). The Pine-leaf scale is very common in many parts of the Dominion. It has not, however, so far as we know, caused any perceptible injury to the trees, although reports from New York State go to show that whenever it is abundant on a tree it does much damage. This scale confines its attacks solely to Conifers. The writer has found it at Guelph on the following Pines: White, Bull, Austrian, Scotch, Jack and Dwarf Mugho, and also on the Norway and White Spruce.

1081. *Chionaspis salicis* (Linn.).—*C. Salisnigrae.* This species is found on Leatherwood (*Derca palustris*), White Ash (*Fraxinus americana*) at Guelph, Ontario.

1096. *Aulacaspis boisduvalii* (Sign). This species has been found in the conservatories at Guelph and Ottawa. At Guelph the writer found it very abundant on several species of Palms, and at Ottawa Dr. Fletcher found it on the Orchid belonging to the genus *Cattleya.*

1127. *Aulacaspis rosæ* (Bouche). Here and there .all over the Dominion we find this rose scale attacking rose bushes and Blackberry and Raspberry canes. The plants attacked are nearly always in damp, shady places, such as overcrowded gardens. Dr. Fletcher has found it common in British Columbia and Nova Scotia.

1143. *Hemichionaspis aspidistræ* (Sign). It is found in conservatories at Ottawa on *Pteris serrulata.*

1198. *Aspidiotus abietis* (Schr.). The Balsam Aspidiotus has a wide range in Western Ontario. It is found on Hemlock (*Tsuga occidentalis*) and Balsam (*Abies balsamea*). In the woods at Guelph this species is very abundant.

Aspidiotus hybridum? This peculiar scale is found very abundantly on Willow and Balm of Gilead at Collingwood, Ontario. This species very closely agrees with *Aspidiotus juglans-regiæ and Aspidiotus ostræformis,* although it is not exactly like either one of them, and Prof. Marlatt, believes that it is a hybrid or cross between these two species. Judging from the infestations, I believe that this species has several generations in a season. It is a very destructive pest and nearly every tree around the fair grounds at Collingwood was attacked and many limbs and trees were dead.

1199. *Aspidiotus æsculi* (Johnson). This species is very common in Western Ontario. It has been found at Guelph, Brantford and Toronto on Basswood (*Tilia americana*) and Horse Chestnut (*Æsculus hippocastanum*).

1200. *Aspidiotus ancylus* (Putn.). The Putnam Scale is distributed fairly widely throughout Ontario, Quebec and Nova Scotia. It has not, however, been known to do much damage, although in some of the States across the boundary it is said to have been quite destructive. It is recorded from Ottawa on Elm; from Toronto on Willow; and St. Catharines on Plum; from Guelph on Cherry and Apple; from East Essex Co. on Plum and Shell-bark Hickory.

1220. *Aspidiotus diffinis* (Newst). This was found in the woods on Basswood (*Tilia americana*) at several places in Western Ontario. Mr. King thinks that this species may prove to be a variety of *A. diffinis.*

1229. *Aspidiotus forbesi* (Johnson). The Cherry Scale, although found in several localities in Ontario, has not yet, with one or two exceptions, been reported as doing much damage. It has been found in Ontario, at Ottawa, London, St. Catharines, Grimsby and Prince Edward County. It is also recorded for Nova Scotia and Quebec. The host plants so far discovered are Cherry, Apple, Hawthorn, Fragrant Currant and Beech.

1233. *Aspidiotis hederæ* (Vall.). This species has been reported from nearly all the Provinces of the Dominion. It is confined to conservatories and house plants. It is a common species on Palms, Ivy, etc.

1239. *Aspidiotus juglans-regiæ* (Comst.). The English Walnut Scale has been found in Ontario in only two or three localities, although it probably exists in several other parts and also in the other provinces. The host plants so far discovered in Ontario are Apple, Willow and Poplar.

1250. *Aspidiotus osborni* (Newell and Ckll.). Osborn's Scale is found on forest trees in northern and western Ontario. It has been found on Paper Birch

(*Betula papyrifera*), Yellow Birch (*Betula lutea*), Cottonwood (*Populus deltoides*), White Oak (*Quercus alba*), White Pine (*Pinus strobus*). It is undoubtedly a very destructive scale.

1252. *Aspidiotus ostræformis* (Curt.). The Curtis Scale is much more widely distributed throughout Ontario than has been hitherto supposed but, in spite of its prevalence, it does not seem to be very destructive. It has been found at Collingwood in Western Ontario and as far east as Trenton in Eastern Ontario. It has also been reported from Chilliwack, British Columbia, and from several places in Prince Edward Island.

1256. *Aspidiotus perniciosus* (Comst.). Wherever it occurs the San José Scale is considered, and rightly so, the most destructive insect in the Dominion that fruit-growers have to combat. Almost every kind of fruit trees and bush fruits are liable to be attacked by the scale. Many shade trees are also attacked. It has become established in the following counties: Peel, Halton, Wentworth, Welland, Lincoln, Haldimand, Norfolk, Elgin, Kent and Essex.

1270. *Aspidiotus ulmi* (Johnson). The Elm Aspidiotus has been found by the writer in several localities in Western Ontario. It is most abundant at Guelph on the Soft Elm (*Ulmus americana*).

1294. *Chrysomphalus aonidum* (Linn.). This Coccid occurs in conservatories on *Ficus elastica,* at Guelph, Ontario.

1295. *Chrysomphalus aurantii* (Mask.). This species has been found on fruit imported from California.

1300. *Chrysomphalus dictyospermi* (Morg.). This Coccid has been found on Cinnamon in a conservatory at Ottawa.

1305. *Chrysomphalus obscurus* (Comst.). This species has been found in Ontario, but my notes on habitat and host plant have been lost.

1330. *Targionia dearnessi* (Ckll.). This interesting species was found by Mr. John Dearness, on Bearberry (*Arcostaphylos uva-ursi*) in the Bruce Peninsula Ontario.

1377. *Lepidosaphes beckii* (Newm.). This species only occurs on imported fruit, oranges, etc., from the South.

1431. *Lepidosaphes ulmi* (Linn.). The Oyster-shell Scale is generally distributed over Ontario, Quebec, British Columbia, Nova Scotia, and Prince Edward Island. It is one of the most injurious scales found in Canada. It is found on a host of plants, some of which are Apple, Pear, Plum, Cherry, Mountain Ash, Hawthorn, Red-osier Dogwood, Black and White Ash, Aspen, Prickly Ash, Mulberry and Horse Chestnut.

1422. *Inchinaspis longirostris* (Sign.). A palm (*Kentia sp.*) was badly infested at the Fruit, Flower and Honey Show, Toronto, 1908.

1442. *Parlatoria pergandei, var. theæ* (Comst.). This species was found on Lemon plants in the Ontario Agricultural College greenhouse at Guelph.

Undetermined Species of Pseudococcus. Specimens have been found on a host of plants, roots, stems, and leaves, but the species have not yet been determined.

ENEMIES OF THE COCCIDÆ.

There are upwards of seventy species of Scale Insects found in the Dominion of Canada at the present time, and these are held in check very largely by other forms of predaceous or parasitic plants or animals which by feeding upon them prevent them from increasing to such an extent as to be uncontrollable. As transportation has developed and commerce and international trade have taken place between different countries, we have introduced not only many useful plants, but the insects which prey upon them. Often in the case of scale insects we have imported the scale and left behind some of the enemies which attack it. This gives the scale a tremendous advantage and often before the balance is restored very great damage is done. To restore the balance more speedily the entomologist looks to the native home of the scale to ascertain its most effective enemies. These are then imported and bred and liberated in various parts of the infested areas. In some cases, such as the Lady Bird Beetle, belonging to the genus Pentilla, has rendered excellent service to the fruitgrower. The chief enemies in Canada are birds, Acarids, insects and fungus parasites. The most effective of these are the Acarids and insects.

It is difficult to calculate accurately the amount of good service rendered by many of the insectivorous birds. Warblers and Vireos, on account of their aesthetic value and also the fact that they are insectivorous are rarely taken and subjected to examinations of stomach contents. Furthermore their minute size render it almost impossible to observe their actual work. The larger birds, such as the Hairy and Downy Woodpecker, have been secured, stomach contents examined and found to contain, in some cases, hundreds of scales in a single stomach. This is especially noticeable in the case of the very destructive New York Plum Scale. It is highly probable that these insectivorous birds rank first in the control of the larger kinds of scale insects, such as Eulecanium, Coccus and Kermes.

The mites again deserve a great deal of credit for their very efficient service to the fruit grower, in that they consume large numbers of scale insects all through the season. Some confine their attacks to one particular species, while others are general feeders, attacking a large variety of insect life. There are about eight known species of Acarids in Canada that are in some way associated with injurious forms of scale insects. There are at least, three species working upon the San José Scale:*Hemisarcoptes malus* is commonly found in the St. Catharines district. Species of *Monieziella* and *Rhyncholophus* were found feeding upon San José at Grimsby, Ontario. Four species were found either feeding upon the eggs or the adult of New York Plum Eulecanium. Three of these species belong to the genus *Rhyncholophus,* and the other to the genus *Gamasus.* All four undoubtedly help to keep this scale in check. Two species are found attacking the eggs of the Oyster-shell Scale. *Tyroglyphis longior* is very common at Guelph, and *Hemisarcoptes malus* at St. Catharines, Ontario. Another species belonging to the genus *Galumna* was found feeding upon the scale known as *Eulecanium fletcheri*.

Insect Enemies.

These, if not the most destructive are at least the most numerous of all Coccid enemies. They represent four orders of insects: the Hymenoptera, Coleoptera, Lepidoptera and Diptera. Mr. Alfred Eastham investigated the parasites of scale insects in Ontario and found twenty-three species belonging to the Hymenoptera.

Host Relations of Species of Aphelinæ Reared During the Summer in the Vicinity of Guelph.

Parasite.	*Host.*
Aphelinus mytilaspidis	Lepidosaphes ulmi.
	Chionaspis pinifoliæ
	Chionaspis salicis
	Aspidiotus perniciosus.
	Aspidiotus ostreæformis.

Parasite.	*Host.*
Aphelinus diaspidis	Aulacaspis rosæ.
Aphelinus fuscipennis	Aspidiotus perniciosus.
Coccophagus lecanii	Pulvinaria innumerabilis.
	Eulecanium cerasifex.
	Eulecanium fletcheri.
Coccophagus cognatus	Eulecanium fletcheri.
	Coccus hesperidum.
	Eulecanium cerasifex.
Coccophagus flavoscutellum	Pulvinaria innumerabilis.
	Eulecanium cerasifex.
Coccophagus fletcheri	Eulecanium fletcheri.
Ablerus clisiocampæ	Chionaspis furfurus.
Physcus varicornis	Chionaspis pinifoliæ.

Host Relations of the Species of Encyrtinæ Reared During the Past Summer in the Vicinity of Guelph.

Parasite.	*Host.*
Comys fusca	Eulecanium cerasifex.
Comys bicolor	Eulecanium fletcheri.
Comys scutellata	Eulecanium caryæ.
Chiloneurus albicornis	Eulecanium fletcheri.
	Eulecanium cerasifex.
	Eulecanium caryæ.
Aphycus jarvisi	Eulecanium fletcheri.
Aphycus pulchellus	Kermes pubescens.
Aphycus pulvinariæ.	Eulecanium fletcheri.
	Eulecanium cerasifex.
Aphycus johnsoni	Eulecanium cerasifex.
Aphycus flaviceps	Eulecanium cerasifex.
Blastothrix longipennis	Eulecanium cerasifex.
	Eulecanium fletcheri.
	Kermes pubescens
Encyrtus cyanocephalus	Eulecanium caryæ.
	Eulecanium cerasifex.
Encyrtus flavus	Eulecanium fletcheri.
Encyrtus sp.	Eulecanium fletcheri.
Encyrtus sp.	Kermes pubescens.

In the Coleoptera the Coccinellids are most conspicuous in combatting the more injurious species of scale insects. A small species known as *Hyperaspis signatus* in the larval stage has been found feeding upon the Curtis Scale at Guelph, Toronto, Grimsby and St. Catharines. In Toronto the same species was found in large numbers feeding upon the Forbes scale on a Hawthorn tree. The larva has also been found at Guelph feeding upon *Aspidiotus æsculi* and the New York Plum Scale. They probably do their most effective work upon the Cottony Maple Scale as it is estimated that they devour about eighty per cent. of the total scales produced in a season. Other species of Coccinellidæ are also beneficial in destroying a number of different scales. Two of the most common species are *Chilocorus bivulnerus* and *Seymus punctatus*.

In the order Diptera only one species is found to be effectual. **This is the** one known as ***Leucopsis belulila*** which parasitizes the Grass Scale (***Eriopeltis festucæ***) in Nova Scotia. There are also two species of Lepidoptera which are parasitic upon scale insects. One species is found attacking ***Kermes galliformis*** and the other species has been taken on the Cottony Maple Scale (***Pulvinaria vitis***).

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ALEYRODIDÆ OF ONTARIO.

PROF. T. D. JARVIS, O.A.C., GUELPH.

There are at the present time three species of Aleyrodidæ found in Ontario: **ALEYRODICUS ASARUMIS** (Shimer) on the Wild Ginger (*Asarum canadense*) and the White Baneberry (*Actea alba*); **ALEYRODES FORBESII** (Ashmead) on Soft Maple (*Acer saccharinum*) and Red-Maple (*Acer rubrum*); **ALEYRODES VAPORARIORUM** (*Westwood*) on Salvia, Solanum, Coleus, Coreopsis, Cucurbita, Cuphæ, Fuchsia, Hibiscus, Lycopersicum, Monarda, Rosa, Rudbeckia, Helianthus, Tropæolum, Verbena, Zinna, Digitalis, Pelargonium, Phlox, Cobea, Dahlia, Ribes, Fragaria, Solidago, Aster, Smilax, Polemonium, Delphinium, Achillea, Calliopsis, Chrysanthemum, Callistemma, Campanula, Antirrhinum, Berberis, Aquilegia, Lonicera, Nicotiana, etc.

Those who have made a special study of this group believe that the White Fly had its origin in some part of South America, the Neotropical region, where they formed the genus Aleurodicus, which except through human agency have remained there ever since. A branch belonging to the genus Aleyrodes has spread over the greater part of the world.

Aleyrodicus asarumis is a very common species in Ontario and was noticed in 1902 on a species of Wild Ginger at Guelph. *Aleyrodes forbesii* was first observed in the fall of 1907 up the River Speed from Guelph where the nymphs were found rather abundantly on the leaves of Soft Maple. *Aleyrodes vaporariorum,* which is most interesting and of greatest economic importance, is believed to be a native of Florida or Mexico; though it was first described and named by Westwood after it had reached England in 1856. Since reaching the United States it has spread gradually through the North-eastern part principally; and wherever introduced has multiplied very rapidly. Previous to 1900 there are only one or two reports of the species in Ontario. In 1903 it had appeared at the Ontario Agricultural College greenhouse and by 1906 had become fully established.

The White Fly or Mealy-wing Fly belongs to the Homopterous division of the order Hemiptera, in which the four similar membranous wings are held roof-like over the body. It is a member of the family Aleyrodidæ, which consists of small, active insects, easily recognizable by a characteristic, white, wax-like secretion, completely covering the wings and giving them the popular name Mealy-wings and White Fly. The young Mealy-winged Flies look much like scale insects and have the same general habits. The larvæ are flattened, oval, scale-like creatures found stationary on the lower sides of leaves. Most species of them bear numerous wax rods and copious secretions of wax all over their bodies. The pupa, also are characterized by their secretions of wax; and the amount and disposition of the rods and fringes on them are made use of very largely in the distinction of species in this family.

In their relationship with other insects the Aleyrodidæ come nearest the Aphididæ and the Coccidæ; from the former they differ most markedly in being stationery during their immature stages, and from the latter in being winged in both sexes of the adults and therefore capable of moving about rapidly.

The life-history of the White Fly (*Aleyrodes vaporariorum*) covers a period of approximately five weeks; and the broods succeed each other constantly, the year round. The eggs are oval, light green, changing to almost black in color, smooth and with a short stalk from one end raising it off the leaf. They are deposited irregularly on most kinds of leaves; but on smooth leaves it is quite characteristic for many of them to be deposited in more or less nearly complete circles. The female has been observed by different persons to accomplish this arrangement of them by inserting her beak into the leaf and rotating around this as on a pivot. The eggs hatch in about ten days, and the young larvæ move about for a short time and then insert their mouth parts into the tissues of the leaf and assume their scale-like form. When fully grown, which is in about two weeks, the larvae are less than a millimetre in length. After about two weeks longer in the pupal stage the adults emerge. It is difficult to say how long they may live in the mature form.

It is only a small family consisting of two genera and about 150 species. Like many of the other families of insects of small size it has been much neglected.

The two species attacking the Maple and Wild Ginger have a wide distribution in Ontario, especially in the Western portion of the Province. *Aleyrodicus asarumis* have been found almost everywhere that the Wild Ginger grows. It is sometimes found on the White Baneberry at Guelph, but it seems to have a decided preference for the Wild Ginger. It confines its attacks to the lower side of the leaves and is usually so numerous as to almost cover this side of the leaf. Large quantities of honey dew are given off by this species and the honey dew fungus nearly always accompanies the insect. The life-history in Canada has not yet been fully determined, but sufficient is known to prove there are at least two broods during the season. It passes the winter in the mature form, but the writer has not yet been able to find the hibernating quarters. Shortly after the Wild Ginger leaves have expanded in the spring the White Fly may be found in the egg stage on the leaf. In the course of a few weeks the affected leaves turn yellow and myriads of the creatures may be seen at work. No insect parasites have been observed at work on this species and from this we may infer that it has been somewhat recently introduced.

Aleyrodes forbesii has been found as far east as Toronto, as far north as Gravenhurst, and as far south as London, Ontario, and the indications are that it is almost as widely distributed in Western Ontario as the maple itself. It is the largest of the three species under discussion. The adults are rarely seen and the large, box-like larvæ are sparingly scattered over the under surface of the leaf. The larvæ are pale green or whitish, somewhat the same color as their surroundings or environment and it is probably due to these two things that this species has not been reported more often. The work of insect parasites has been observed on several occasions in connection with this species and this probably accounts for the comparatively small amount of injury done to the host. The ravages are much less some seasons than others.

It is interesting to note that the above two species are both found in the State of Illinois.

Aleyrodes vaporariorum is of very great concern to people engaged in greenhouse work. From enquiry made to florists in all parts of Ontario it would appear that not a single section is free from the pest. As it cannot, so far as is known, winter in any stage out-of-doors, at least in its northern part of its range, it is recognized principally as a greenhouse pest, but it is sometimes very common and destructive to gardens and small fruits, especially in the vicinity where it is carried over the winter in greenhouses. It appears to be very partial to members of the family of plants known as the Solanaceæ, i.e., tomato, tobacco, etc. Several reports have been received from gardeners in different parts of the Province where crops had been ruined by this pest. It is sometimes very abundant on the strawberry and currant plants. In the fall when the temperature lowers they seek shelter in green houses or homes where plants are kept and a constant reproduction is kept up the year round.

Another way in which these species do injury is due to the supply of honey dew given off where a fungus grows and spreads over the surface of the leaf, interfering with the nutrition of the plant.

The insect is not a good flyer, but can go considerable distances with the wind, and whole neighborhoods are often infected in this way. The flies are often carried from place to place on infested plants or parts of plants for identification purposes. They cling tenaciously to clothing and are sometimes carried from greenhouse to garden in this way.

So far very few parasites have been found at work on the Aleyrodidæ of this country and these have not yet been identified. In South America and other tropical countries many species have been found, notably the families Trichogrammatidæ, Aphelinidæ, Eupelinidæ, Mymaridæ, Platygastridæ, Diapridæ, Formicoidæ of the Hymenoptera, Chrysopa of the Neuroptera, Thrips, belonging to the Thysanoptera; Mites of the Acarina. In addition to the above-mentioned families of insects and acarids two genera of fungi, Aschersonia and Sphaerostilbe also assist in the control of the White Fly.

It is my experience that considering all kinds and conditions of plants and greenhouses cyanide of potassium, although perhaps used the least, is the cheapest and most effective means for fumigation. The best results are obtained by using ¾ of an ounce of potassium cyanide at a cost of 2½ cents, and 1½ ounces of sulphuric acid at a cost of about ¼ cent, per thousand cubic feet. This method, besides costing only about 2½ cents per thousand feet, is thoroughly effective and requires little labor in its application.

As this means has heretofore been considered by a great many florists as dangerous to human life in its application, it has been but sparsely used. The solution, however, is so weak that there is not the least danger to human life or health if only the simplest precautions are taken.

The formula recommended is as follows:

Potassium cyanide, 1 ounce by weight;
Sulphuric acid, 1½ ounces by volume;
Water, 3 ounces by volume.

The cyanide should in all cases be chemically pure, 98 per cent pure cyanide, and the sulphuric acid should be the best commercial, or 85 per cent. grade. It is always best to have the cyanide broken up into small pieces. Generators should always be earthen or glass vessels, never metal, having a gallon capacity. In order to distribute the gas equally throughout the greenhouse it is well to place the generators at equal distances apart along the walls. The greenhouse should be as much as possible airtight, with dry atmosphere and a temperature of below 60 degrees Fahrenheit, and the generation of gas should be done after darkness has set in. After having placed the generators properly, with water and sulphuric acid, the packages of cyanide are then added, commencing at the generator farthest from the place of exit, and the operators should then leave as soon as possible and close the door. The dropping of the packages of cyanide into the generators by means of a cord operated from a position outside of the greenhouse is entirely unnecessary and is now quite obsolete, as the fumes from the composition are too weak to do any injury. The quantity of the doses must, however, always be regulated by the florist from the condition of the greenhouse, the plants, and the insects to be destroyed.

It is the confidence I have in the remedy which prompts me to highly recommend it as the cheapest and most effective means for destroying the White Fly in greenhouses, without, however, destroying or endangering the health or life of plants or of the operator of this remedy, and I would encourage in every way possible the use of this means that these insects, if not totally destroyed, are still so kept in check as to do but the minimum of harm.

SOME INSECTS OF THE LARCH.

J. M. Swaine, Macdonald College, Que.

It is my intention to describe to you this afternoon rather briefly an attack made this summer upon a small clump of larch by a series of scolytid beetles; and to use this attack as an illustration of the breeding habits of Scolytidæ in our great forests of pine and spruce.

The larch bush to which I refer is situated at Hudson, about ten miles west of Ste. Anne's. The trees were fine specimens of Larix of medium size, with an average height of perhaps 40 feet, and until this season had been particularly healthy. Previous to this season I had not taken a scolytid from larch in that immediate neighborhood. Last winter a wide section was cut through the bush, and a plank walk laid through it, about three feet from the ground. The stumps were left rather high; the greater part of the rubbish was removed; several untrimmed larches were left lying in the clearing and one was lying well shaded by standing trees; and the trunks which had not been removed were piled in the clearing and left to dry through the summer.

The scolytids which attacked the dying bark, thus provided, belonged to five species: *Dendroctonus simplex, Dryocoetes autographus, Dryocoetes* n. sp., *Ips caclatus* and *Ips balsameus.* In the wood of the stumps an ambrosia beetle, *Gnathotrichus materiarius,* bred in large numbers.

I wish first to discuss the habits of these species very briefly.

D. simplex, Lec. This species is the common Dendroctonus of larch and is probably to be found wherever that tree is abundant. It is recorded from West Virginia northwards to Ungava and west to Michigan, and I have seen specimens in Mr. Evans' collection from Mackinak, Man. As the larch is found throughout all Eastern Canada excepting Northern Ungava and westwards to the Rockies, excepting the Barren Grounds, this beetle will probably be found throughout all that region. It is not a particularly injurious species. It prefers the bark of stumps and recently cut and dying trees, but will attack apparently healthy trees when dying bark is not to be obtained. It occurs chiefly in the bark of the trunk.

This species was first noticed this season on July 10th in the bark of larch stumps. The trees had been cut the preceding winter, and cleared away, leaving stumps about 1½ feet high. The place was swampy, and although the stumps were in the open sunlight, they remained sappy throughout the season. Only a part, perhaps half, the stumps of the clearing were attacked by this species. On July 10th—the date on which they were first noticed—the egg-tunnels contained eggs in the outer ends; and larvæ of all sizes, from those recently hatched up to nearly full-grown, were boring in the bark. There were no pupæ and no young adults.

About a month later (August 6th) the tunnels in these stumps contained full-grown larvæ, pupae, recently transformed, light coloured adults, and older, darker adults; and many adults had escaped, as evidenced by the holes through the bark above the ends of the larval tunnels. The larvæ were in tunnels coming from the distal end of the egg-tunnel; the pupæ in the ends of larval tunnels arising nearer the entrance hole; the light-coloured adults in tunnels arising still nearer the entrance hole; and, lastly, the darker adults in tunnels coming from the proximal end of the egg-tunnel.

On the same day, August 6th, this species was found in large numbers starting tunnels in a felled larch which lay near the stumps just referred to, but shaded by standing trees. A few felled larches lay in the open clearing, but these were not attacked. Egg-tunnels of this second brood were also found in many of the stumps. A standing larch, evidently dying, contained many fresh tunnels of *Ips balsameus* but none of *D. simplex.*

The tunnels of *simplex* in the fallen larch were, on Aug. 6, usually well started, with numbers of eggs already laid, but no eggs had hatched. Very evidently we had there a second brood, although I did not actually trace the newly transformed beetles from the stumps to the felled tree, and one brood a season has hitherto been recorded for this beetle.

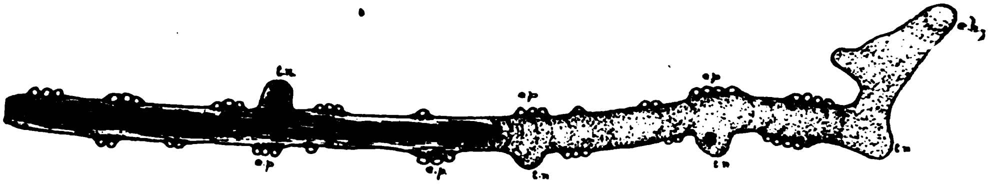

Fig. 4. *D. simplex*, Lec. An egg-tunnel showing egg-pocket, e.p., containing eggs; turning niches, t.n., and entrance-hole, e.h.

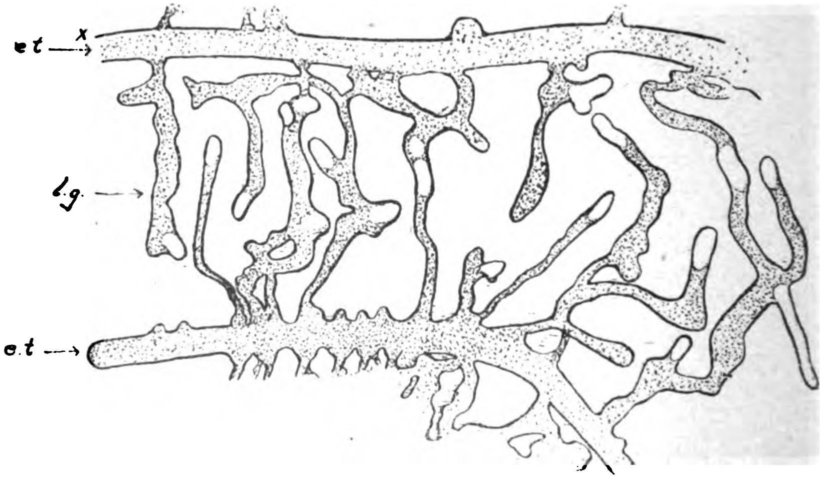

Fig. 5. *D. simplex.* Development of larval galleries; larvæ half-grown. e.t., egg-tunnels; l.g., larval galleries; larvæ were working in the clear spaces.

The egg tunnels are about ⅛ inch wide, although the width is very irregular in the different parts of the tunnel. In an egg-tunnel recently started, the half nearest the entrance hole will be packed tightly with chips and excrement, and in the distal—empty—half will be found the beetles, a pair or more. In some I have found one female and as many as three males. As the tunnel is lengthened, the refuse, chips and excrement, is packed towards the entrance, leaving always a short, clear space at the distal end. As the tunnel increases in length, shallow pockets are cut in the bark along the sides, and in these the eggs are deposited, on end, and packed in dust. Usually three eggs are found in a pocket, but sometimes 4, 2 or 1. The pockets are cut at the end of the tunnel on the side, so that the female must reverse her position to oviposit. The diameter of the tunnel will not admit of this, so along the sides of the tunnels are found wide niches, as wide as the tunnel, which may be called turning-niches. These seem to be used by the beetles in turning about and in passing each other in the tunnel. Very rarely an egg or two will be laid on their sides. The eggs of one pocket being laid, the female lengthens the tunnel and cuts another egg-pocket, and so on until all her eggs are deposited.

The chips resulting from the boring operations, together with the excrement of the beetles, are packed firmly backwards towards the entrance hole, and not uncommonly eggs are found packed in this mass. By the time the tunnel has neared completion, we find usually a female in a clear space at the tunnel's end, and behind her the dust packed firmly with one or two clear spaces at intervals, in each of which will be a male completely walled in and contentedly feeding on the chips or on the sides of the tunnel. Not infrequently there will be an egg-tunnel branching from the first, cut by a female which had entered the first tunnel before the entrance was blocked with chips. These side tunnels often open into neighboring egg-tunnels, so that adjoining tunnels appear to anastomose. Occasionally ventilation holes are cut in the bark forming the tunnel roof, but very few of these were noticed.

The larvæ which hatch from the eggs along the tunnel sides bore into the bark away from the egg-tunnel, cutting the larval galleries, which at first very tiny and entirely in the bark, gradually increase in diameter as the larvæ grow, and finally score the wood. The larval galleries are extremely irregular, crossing and recrossing each other until the bark of that part is almost entirely reduced to powder, which packs the galleries. The larvæ which hatch from eggs laid in the chips packing the egg tunnel feed upon the mass of chips for a time, and later enter the bark from the tunnel sides.

Egg-laying lasts over a considerable period. Eggs and newly hatched larvæ of the second brood were found as late as August 26th. This second brood matured in sticks in the laboratory early in October, and emerged through holes in the bark.

Polygraphus rufipennis. This common bark beetle of spruce and pine seems quite as ready to attack dying larch bark, for we found it this season in great numbers in the piled larch trunks and tops and the felled larches lying in the clearing. I have never found this species in healthy trees. It is very common in dying bark of spruce, and, in our section, in red and white pine. This is a small bark beetle, 3mm. long, of a uniform dark brown or nearly black colour. It is readily distinguished by the combination of divided eyes and undivided, distally pointed, pubescent antennal club. Its work is well illustrated in the collection exhibited. An entrance hole is cut through the bark and a shallow chamber, called the nuptial chamber is excavated therein. From this chamber are cut in a radiating fashion, and between the bark and wood, from three to five egg-tunnels. The females cut the tunnels and in the nuptial chamber will be found the only male busy ejecting through the entrance hole the boring dust which the females have brought to the tunnel entrances. The eggs are laid singly along the sides of the tunnels, each in a tiny pocket called an egg-niche, and firmly packed in dust; so that the sides of the tunnel are smooth and the eggs completely hidden. From a few to twenty eggs will be found on each tunnel side. The larvæ which hatch from the eggs bore into the bark directly away from the egg-tunnels. When the larvæ are not much crowded their tunnels are fairly regular, but when many egg-tunnels lie close together, as is usually the case, the larval galleries cross and re-cross, completely riddling the bark eventually. The larvæ pupate in the ends of the galleries and emerge by cutting each a round hole through the overlying bark. Often, as with many bark beetles, the young adults feed for a short time on the bark before cutting through to escape.

We have two broods of this species. The tunnels of the over-wintered beetles were started the last of May this year in the larch. By July 10th in these tunnels could be found well-grown larvæ, pupæ and young adults; and light coloured, and therefore recently transformed adults, were busy starting tunnels in felled larches lying in the clearing. The adults continued to emerge for several weeks, and on August 6th egg-tunnels were being cut and eggs laid in the fallen larch before referred to in connection with *D. simplex.* So far as my observations go, the tunnel is started by a female, and a male, and other females, join her later. The egg-tunnels are usually kept clean in this species, although more or less boring-dust is at times found in them. They seem to start their tunnels, at times, from the sides of a *simplex* tunnel, where they are sometimes found exploring during the entrance season. This second brood will apparently mature completely this fall, and hibernate as adults.

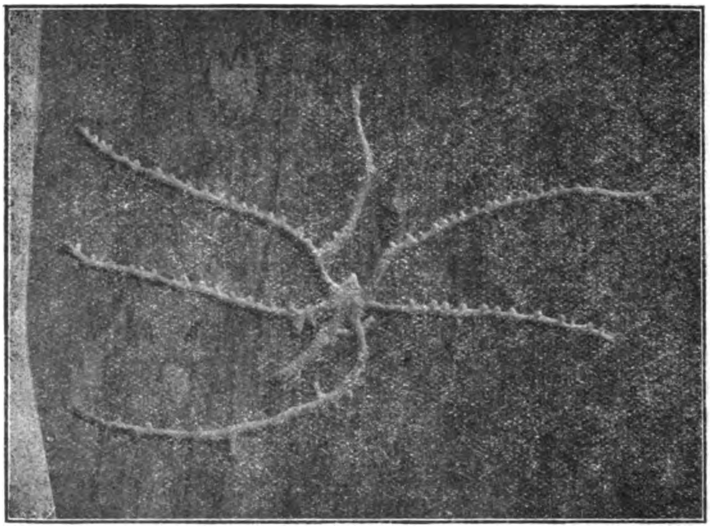

FIG. 6.
Work of *Ips balsameus* in Abies, showing nuptial chamber, egg-tunnels, and egg-niche. The eggs were removed before hatching.

Ips balsameus was found on the 10th of July, starting tunnels in a diseased larch in the same bush. I could not be sure that this species had been the primary cause of the injury, apparently not, but certainly *balsameus* was helping things along merrily. This species breeds chiefly in the fir, sometimes also in the pine; and it frequently attacks and destroys trees, which, while certainly unhealthy at the beginning of the *balsameus* attack, might otherwise survive. It is to be considered an injurious species in fir and larch. There are two broods each season with us; the first eggs were laid in pine this season in the middle of May, and the second was, in larch, as just stated, early in July.

Ips cælatus—a larger but closely allied species—was numerous in the larch stumps. Its entrance hole is deep, and the nuptial chamber is often entirely in the thick bark. From the nuptial chamber come off the winding, irregular egg-tunnels. The eggs are laid in groups of two to eight, in deep pockets along the sides of the egg-tunnel. The borings of the larvæ are very irregular and penetrate the bark in all directions. The larvæ pupate in their tunnels in the bark, and appeared through their exit holes early in July to start tunnels for a new brood. Egg-laying for the second brood was well advanced in the bark of the stumps on July 10th of this season. This species is common in our district in red and white pine. It works in the bark towards the base of dying trees; particularly it is found in stumps cut the preceding winter. I have never noticed it in healthy trees, although it might injure them when no dying bark was available. The first brood was egg-laying in white pine at Ste. Anne's, the second week in May this year, and when first noticed in larch, May 24, the eggs were practically all laid.

Dryocoetes autographus was breeding in the bark of the larch stumps. Its egg-tunnels are irregular, anastomosing, and when numerous difficult to follow.

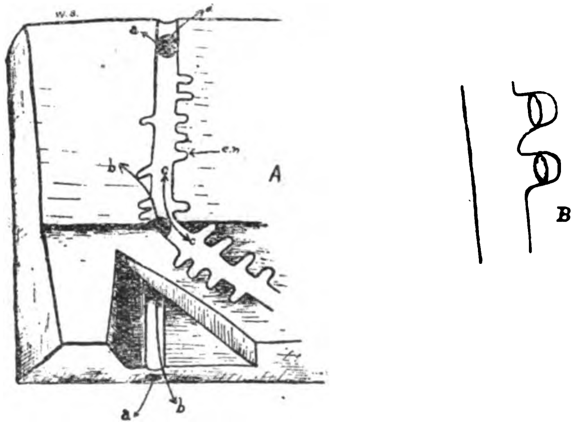

Fig. 7.
G. materiarius. Work in larch wood. A.—w.s., wood surface; e.n., egg-niche; d., a tunnel ending blindly behind a. In this tunnel the fungus develops rapidly. Eggs and larvæ have been removed from the niches. B.—Two eggs in position in the niches.

The eggs are laid side by side in shallow niches along the side of the egg-tunnel, and packed in dust. The longer axis points away from the centre of the tree. Frequently the eggs are sunken irregularly into the bark of the tunnel roof and packed in dust. The larval galleries are very irregular, usually destroying the bark. Both egg-tunnels and larval galleries are often entirely in the bark. There are two broods each season with us. By July 10th this season the egg-tunnels were about completed in the larch stumps, with the eggs practically all laid and many larvæ working into the bark. By the first of August these larvæ had matured in part and eggs were being laid in new tunnels from the sixth to the twentieth of that month. This insect prefers dying and dead bark of pine, spruce and larch, and works mostly at the base of the tree. It is not particularly injurious. A smaller, undescribed species of *Dryocoetes* was working with *autographus,* and has very similar habits.

This completes the list of the true Bark-beetles found in those larches. There was also present another scolytid—*Gnathotrichus materiarius*—one of the Ambrosia beetles. This species bores well into the wood, cutting several side tunnels; each tunnel is cut, usually, by a separate female. The eggs are laid in shallow niches cut in the wood along the sides of the tunnels. The eggs are spindle-shaped and wedged into the niches, one in each, a little above the bottom, and a mass of chips and excrement, on which the ambrosia starts, is plugged into the opening. The larvæ deepen the niches until the depth is slightly greater than the length of the larvæ when full-grown. In these niches the larvæ pupate, and from them the adults push their way through the wall of dust and fungus which has previously blocked them in from the tunnel. The chief food of both adults and larvæ seems to be a fungus which grows on the walls of the tunnels and niches. The fungus is carried from tunnel to tunnel by the beetles, and stains the walls deep brown or black. The habits of the Ambrosia beetles are very interesting, but I shall not discuss them further at this time. There are two broods of this species in our district. The first brood was egg-laying this season on May 24th, and matured late in July. By the 6th of August new tunnels were being started in the stumps, and eggs laid for the second brood. Many eggs of the second brood were apparently destroyed by minute nematode worms.

This species breeds in pine and spruce as well as larch and its tunnels often injure lumber for the most valuable uses.

Only two of these beetles, *D. simplex* and *I. balsameus*, can be considered as serious larch enemies, and this is the first time that I have taken *balsameus* from that tree. *D. simplex* is known to attack and destroy but slightly diseased larches under certain conditions, and those conditions I wish to discuss now very briefly. Previous to this season *D. simplex* had been rare in that neighborhood, but it came in in fairly large numbers this spring, attracted from a considerable distance by the dying larch bark. Only half the stumps were attacked by the spring swarm, but the progeny which matured in midsummer numbered thousands of individuals. These parents of the second brood entered the bark of the remaining stumps, and of the felled larch in the shade in great numbers. They did not attack the dried bark of the cord-wood, nor of the felled trees in the clearing. The individuals of the second brood at present in that swamp must number many thousands. Whether or not they are of sufficient number to successfully attack standing trees is a problem which I shall watch with interest next season.

If, after the available dying bark has been utilized by the beetles next spring, there are but few individuals left, they will gradually scatter in search of a further supply of bark in such condition. If, however, there are immense numbers in the swamp unable to find bark in the condition which suits them best, they may succeed in ovipositing in the bark of but slightly injured, or even healthy, trees, in which case the larvæ would probably mature and the trees be killed. When a few scolytid beetles attack a healthy tree, usually the vigorous flow of sap drives them back before the eggs are laid, and the tree suffers but little. When the number attacking a tree is very great, the many entrance holes and started tunnels check the sap flow so that the beetles succeed in laying their eggs and the resulting larvæ develop in the devitalized bark.

The level of numbers at which a species, usually not injurious, will attack healthy or but slightly diseased trees is known as the Pest Level.

It will be seen that a slight modification of the method of cutting would have averted any danger from these beetles. If the stumps had been cut lower a few blows of the axe would have removed most of the bark from each. If then all the trunks had been trimmed and left in the open sunlight of the clearing there would have been but little sappy bark for the parents of the second brood, and they would have scattered from the region, leaving a very small and harmless second brood.

The pest level of *D. simplex* is high. It is perhaps rarely injurious. But the pest level of certain species attacking pine and spruce is low, and when that level is reached the finest trees of the region are in danger.

It can be easily seen from this that careful destruction of wastes from cutting is of utmost importance in lumbering operations, the more so that many other forest insects breed in such dying bark and wood.

The conditions which obtained in this larch bush will be found everywhere in Canada, in the woodlots, in the lumbering districts, and in our virgin forests.

In the great forests under natural conditions we find that when, through the agency of forest fires, heavy storms or the attacks of other insects, scolytid beetles find much dying bark in a suitable condition, they breed in this until they reach their pest level for those conditions; then they attack and kill the healthy trees. Witness the terrible destruction of *D. piceaperda* in the spruce of Maine and New Brunswick, as described by Dr. Hopkins.

In the lumber woods the present careless method of cutting leaves culls and refuse to breed these beetles and other forest pests by myriads.

I pointed out a few moments ago that scolytid beetles followed forest fires, breeding in the dying bark of injured trees. Dr. Hopkins, the leading forest entomologist of America, has shown that the relations are at times reversed; so that fires which would otherwise have caused no considerable injury, gain headway in districts of forest devastated by these beetles, and sweep as great conflagrations over square miles of territory.

It is well to discuss the injury which these forest insects are known to do, but can anything be done to check them in our timber limits and in our great forests?

The control of certain forest insect pests, e.g., the larch saw-fly, is, so far, beyond man's ability. But a method of control has been worked out whereby many forest pests, chiefly Scolytidæ, can be effectively kept below the pest level. Such methods have been successful in European forests, and in certain sections of the United States, and will most surely be followed in Canadian forests in years to come. They consist in modifications of the methods of cutting. Injured trees, with the bark filled with thousands of these beetles, are cut, and either barked or got into the water before the beetles emerge to start their tunnels in other trees. Either the barking, if done at the right time, or the immersion in water, destroys the greater part of the larvæ or adults. These beetles seem, perhaps invariably, to prefer dying bark. Therefore by girdling, early in the season, trees selected for later cutting, the greater part of the beetles in the immediate neighborhood can be attracted to the bark of these "trap-trees," and later these trap-trees are barked or got into the water early, so that the contained brood will be killed. The refuse, tops and branches, are destroyed, removing what would otherwise be a suitable breeding-ground for many species.

Such modifications in methods of cutting can be relied upon when control is needed.

Before such methods can be outlined, however, it is necessary to obtain much information from forest entomologists. The insect pests of our Canadian forests have been studied but little. There are many injurious forest insects in Northern Quebec and Ontario about which we know absolutely nothing. There is much work to be done, therefore, by the systematist; work which is absolutely essential. The practical entomologist must be able to distinguish with certainty the injurious species when he finds them. For instance, if recently killed pines are found with the bark filled with *Ips pini*, there is little cause for alarm. The pest level of that species is high. The same is true of a new species of Phlœotribus, which I have from spruce, and many other, indeed most, scolytids of this region. These species prefer, and usually are able to find dying bark for breeding purposes. But if spruces are found with *Dendroctonus piceaperda* in the bark, the matter may be serious enough; for this species is quite capable of destroying the finest of the spruce over miles of territory if once it surpasses the pest level. Much work should be done in the near future in collecting and studying the forest insects.

It is further necessary to know the exact life histories of the injurious species in the regions where they are numerous. The lumberman must know when to girdle the trap-trees, when to cut them and others with the bark filled with the brood, and bark or immerse them. He must know how many broods occur, and just when they appear to attack fresh trees. Many things must be known before we can outline profitable methods for the control of many of these pests.

This information must be obtained by entomologists; and those of us who are interested in forest insects have a great field before us, a splendid opportunity, and also a serious duty.

Insect control is only one factor in the great problem of forest culture; but it is an extremely important factor, and the sooner we know the injurious insects of our great forests, and their life histories, the sooner will the control of forest insects be undertaken in the Canadian woods.

The great forests of the United States have been almost swept away by forest fires, insects enemies and careless cutting. Now, perhaps too late, the people there are awake to the importance of forest control. We in Canada are following exactly in their footsteps. Great fires—there are hundreds of fires in our Northern forests every season—insect devastations, careless cutting, little effort towards reforestation; it needs no prophet to foretell the result.

Quebec, New Brunswick, Nova Scotia and British Columbia will surely soon follow the lead of this Province in taking decided steps towards forest control. And that good time will come the sooner if we entomologists preach at every opportunity that most important practice in the control of insect pests and fungous diseases, whether in the field, the orchard, or the forest—*Clean Culture.*

INSECT NOTES FROM STE. ANNE'S —NOV. 15, SEASON OF 1910.

J. M. SWAINE, MACDONALD COLLEGE, QUE.

ORCHARD INSECTS.

The Apple Woolly Aphis, *S. lanigera,* has been gradually increasing in numbers with us for the last few years. It is found on many of our older trees in small masses, and is quite thickly scattered over the young orchard. On the young trees there is much more of it on the twigs than on the trunk just at this season, and the scars it causes are becoming numerous enough to need attention. Kerosene emulsion diluted 1-9 and driven in a strong stream controls it readily. I have never found the root form in Quebec, although it probably occurs in small numbers.

The Round-headed Borer, *Saperda candida,* occurs in very small numbers in our orchards; although it is common enough in an orchard about a mile away. At Cote St. Paul and at Rougemont it is doing serious injury.

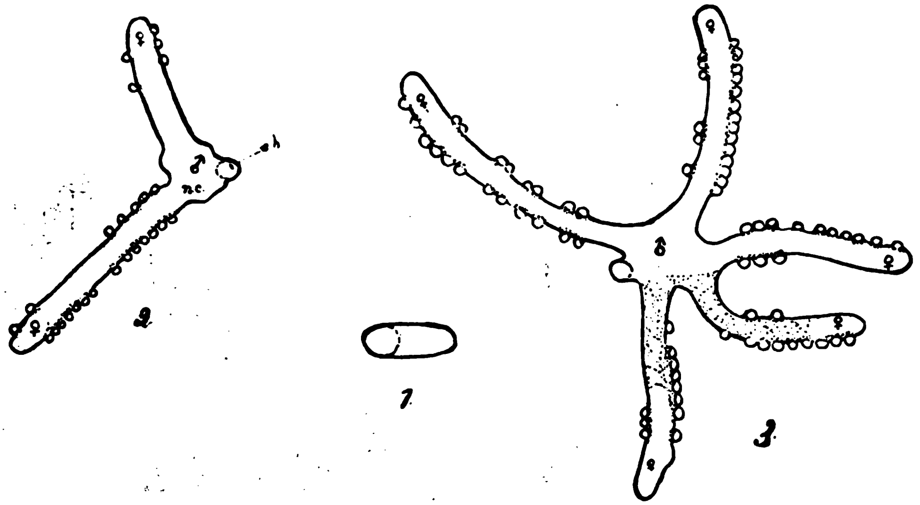

FIG. 8.
Work of *P. rufipennis*. Three stages in the development of the egg-tunnels.

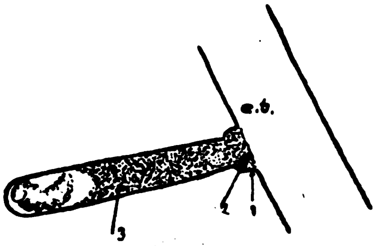

FIG. 9.
I. balsameus. Development of larval gallery. 1, egg-niche; 2, egg-packing; 3, chips and excrement of larva, darker in color; e.t., egg-tunnel.

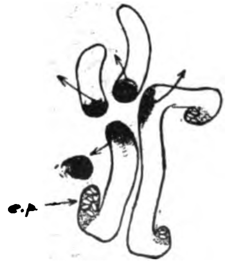

FIG. 10.
Larch Ips. Under side of bark.

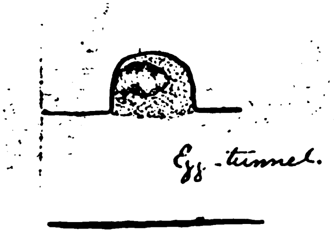

FIG. 11.
I. balsameus. Newly hatched larva.

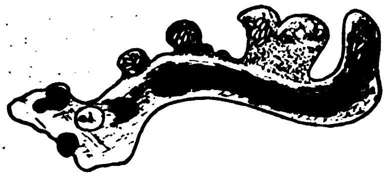

FIG. 12.
The Larch Ips (24-V-10). Under side of the bark shown, with eggs in the pockets.

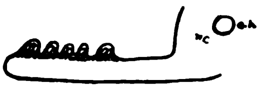

FIG. 13.
I. caelatus. From white pine.

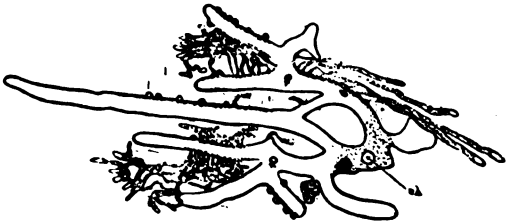

FIG. 14.
Dryocoetes autographus. Work in larch bark; larvæ one-third grown.

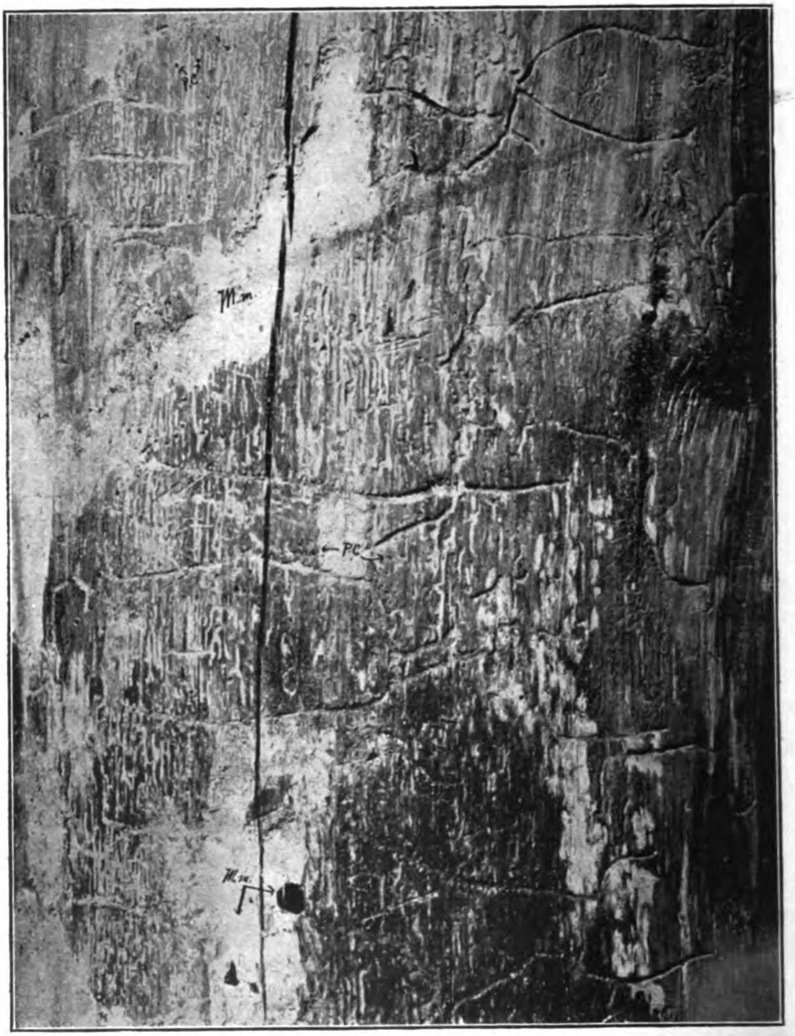

FIG. 15.
Work of *Ips balsameus* in Abies, showing the wood surface scored by the chambers, egg-tunnels, larval galleries, and pupal cells. The latter are often sunken as indicated at "p.c." The work of *Monohammus marmorator*, which was bred from that trunk, is shown at "M.m."

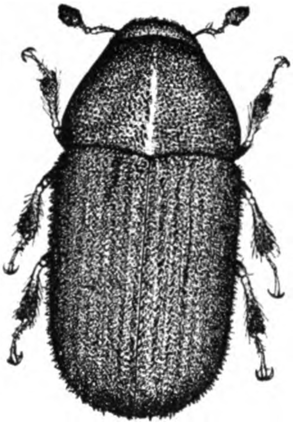

Fig. 16.
Polygraphus rufipennis
(Kirby).

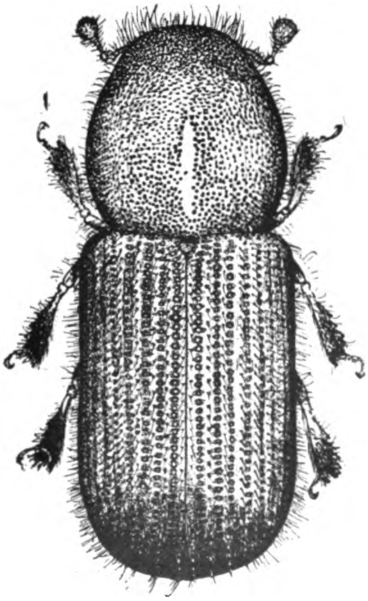

Fig. 17.
Dryocoetes autographus **(Ratz).**

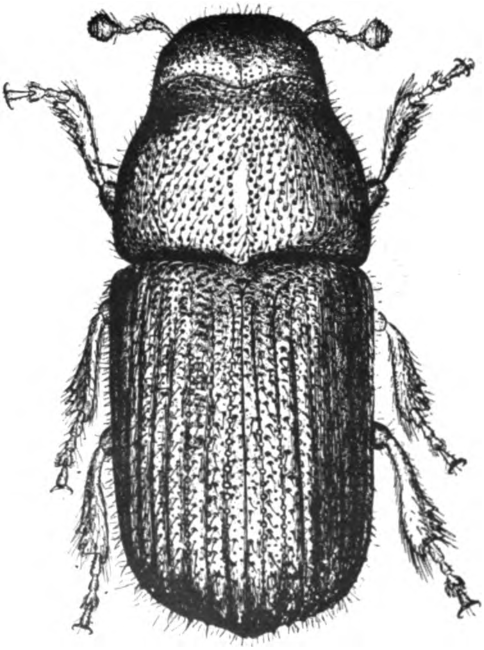

Fig. 18.
Dendroctonus simplex **(Lec.).**

The Flat-headed Borer, *Chrysobothris femorata,* is hardly found in our apple trees at all. And this is interesting, for the species is very common in the neighborhood, breeding in great numbers in fallen hickory and oak, particularly the former. This spring I took scores of specimens from one fallen hickory at Hudson, a few miles from Ste. Anne's. The beetles run about over the bark on fine days, mating and egg-laying, and fly very readily with a distinct "hum." Egg-laying begins with us on hickory in June, and lasts until late in July, although the greater part of the eggs are laid by the second week of July.

In our region at least the beetles much prefer dying hickory to apple trees in any condition, and I feel confident that Mr. Chittenden's suggestion that broken branches of hickory scattered about the orchard would trap most of the beetles, is one well worth trying when these beetles are injurious in orchards.

The Fruit Bark-beetle, *Eccoptogaster rugulosus,* is not yet to be found in our orchards. I have never taken any indeed in this Province.

The Peach-tree Bark beetle, *Phloeotribus liminarus,* was found in great numbers this season in wild cherry near the college. Over a score of large trees were studded with the gum from its entrance holes, although the beetles succeeded in breeding in very few of them. The entrance holes, and in a few places on some trees the egg tunnels, were cut this spring but very few eggs were laid. Again on the tenth of August, light coloured adults were starting tunnels in the bark.

Next year these cherry trees will probably have a hard time of it. They had enemies enough before, indeed, for the common cherry borer was altogether too plentiful.

Xyleborus dispar I have never taken in Quebec. A close ally, *X. serratus,* is very common in several forest trees, notably in yellow birch.

Last spring I bred from apple-twigs sent from Cambridge, N. B., a species of *Oberea,* which is possibly *O. tripunctata.* The female cuts three rows of bites and lays the egg between the bark and the wood above the second row. The grub feeds at first in the dying tip, and later bores downwards through the twig. The twigs are found dead during the summer and are frequently broken by storms. The injury is not serious, as yet, but the species may easily become an injurious pest.

The Buffalo Tree-hopper, *Ceresa bubalus,* has badly scarred several of our young trees. The cuts were made on both the stems, which are very small, and the branches. Soft maple seems to be preferred by this insect for egg-laying, and until the young maples were cut away from near our orchard the fruit trees were left entirely alone.

The Bud Moth, *Tmetocera ocellana,* was present in considerable numbers in our young orchard this season. Owing to lack of labor, early sprayings had to be omitted, and the result is intimated in the accompanying photograph. A poison spray, late in July, should control this insect effectively for the next season. The caterpillars begin to pupate about June 10 with us. The first adults appeared in the cases June 28, but empty cases were found in the field as early as the 18th.

When our orchard is sprayed with lime sulphur, winter strength, early in spring, we see little of the bud-moth, the case-bearers, or the leaf-aphides. I do not say that lime sulphur controls these insects, but our experience, so far, seems to indicate it.

The Cigar Case-bearer of the Apple, *Coleophora fletcherella,* was unusually abundant on our fruit trees this summer, and apparently the same species was breeding on thorn. The larvæ ceased feeding about June 15th, this season, and the first pupæ were found on the 20th. The first adults appeared in the cages on

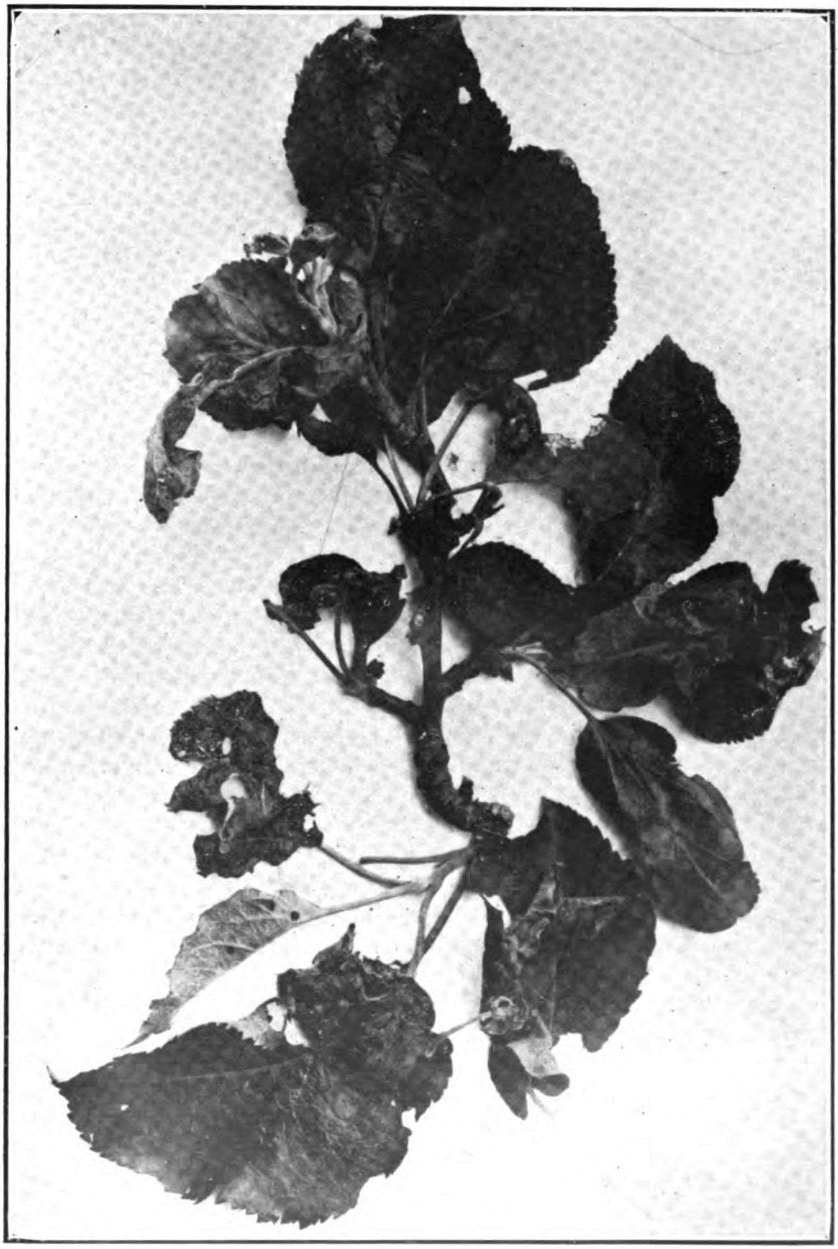

Fig. 19.

Tmetocera ocellana, Bud-moth. Work on apple-leaves.

June 29th, and on the same day a larger, distinct, undetermined species of *Coleophora* was bred from cases on the thorn.

The Pistol Case-bearer of the Apple, *C. malivorella,* was present also in considerable numbers.

The Permanent Apple Aphis, *Aphis pomi,* was exceptionally numerous this season, and with it many *A. sorbi.* The leaves were badly curled, but its parasites controlled it before serious injury was done. Very few Aphides of either species could be found on the trees during the summer, but early in October both species were again common, and the leaves were curling badly. *A. pomi* was vastly more numerous, however, and seemed responsible for the curling. It has been reported that the leaf curling was due mainly to *sorbi.* It does not seem so with us. K. emulsion, or better, fish oil soap, about the middle of October would effectually control them for the following season; and lime sulphur, 1.04 S. G., sprayed in the early spring seems to be effective. Even in Quebec, where the San José is as yet practically unknown, a regular annual spray of lime sulphur, 1.04 S. G., seems a most excellent orchard practice.

The Apple-tent, *Malacosoma americana,* has its cycles with us, as elsewhere, and just now is on the increase. Many egg-masses are found this fall, whereas for the last two years but few were to be had. The Leaf-roller, the Leaf-crumpler, and two Leaf-miners have been common but not injurious.

The Codling-worm, *Carpocapsa pomonella,* has furnished us nothing new; except perhaps that it has discovered that we want it for class use and refuses to spin its cocoons on the trees. For some reason or other we found only about six cocoons on the trees this spring, although the species is not by any means rare.

The Plum Curculio, *C. nenuphar,* is not troublesome in our apples, although it will soon be a plum pest with us—our plums are just beginning to bear. The species causes more injury to apples than any other insect in some Quebec localities. As an apple pest I am quite of the opinion that it can be partially controlled by having a few plum trees in the orchard as traps. Thorough spraying with poison for the codling-moth, and rigid destruction of all fallen "wormy" fruit usually controls this pest.

The Apple Curculio, *A. quadrigibbus,* is injurious in a few Quebec localities, notably in Covey Hill region. A large orchard there has a considerable portion of the fruit distorted this season, and I think much of the injury is due to the punctures of this pest. Careful destruction of the fallen fruit is of importance in the control of this insect, and jarring is of use on small trees. Probably it is effectively controlled by spraying regularly for the codling-worm. This curculio lays its eggs in a simple puncture, and does not cut the crescent-shaped slit as does *nenuphar.* It pupates within the apple fruit.

The Apple Maggot, *T. pomonella,* is found in but few localities in Quebec, notably at Como, and in the region about Hemingford and Covey Hill. It has been effectively controlled at Como by careful destruction of the fallen fruit. That is, so far as known, the only effective method of control.

The San José we do not know in Quebec, although it has been reported from one place this summer near the Ontario line. *A. ostreæformis* was found here this season on plum trees. Our only apple scale is the Oyster-shell, *L. ulmi.* It is, however, often injurious, and is too frequently overlooked. There is no excuse for its presence in injurious numbers. Lime-wash in the late fall, or lime-sulphur in the early spring, with a contact-spray as the young appear in the late spring effectively control it. It is in neglected orchards that we find the Oyster-shell in abunnce.

The Canker worms, *A. pometaria,* and *vernata,* trouble us but little at Ste. Anne's. In parts of Quebec, however, they are of local importance, and in the Annapolis Valley of Nova Scotia are among the worst of the apple pests. Under ordinary circumstances we recommend lead arsenate, applied as needed, and *when the caterpillars are small.* Carefully applied, and carefully watched bands of tree-tanglefoot are perhaps profitable in the districts worst affected. The males and females of *A. pometaria* have been common here this fall and were abundant until late in November; but we find most about the maple trees.

SMALL FRUITS.

The Currant Span-worm, *C. ribearia,* has become a pest with us. Its spotted looping caterpillars feed voraciously, and seem harder to kill than the common saw-fly larvæ. Paris green is always effective, and plenty of hellebore will do the work. The caterpillars are very common early in June, and pupate the last of the month. The first moths appeared in our cages on July 4th, but were found outdoors on June 29th. The egg-laying period extends over several weeks.

The Currant Borer, *Sesia tipuliformis,* has nearly ruined a currant patch in this neighbourhood. Last year, on July 9th, we noticed a number of dying canes, which proved to have been killed by larvæ of this species. The larvæ had escaped and only two parasitized pupæ were found. There was nothing to be done then, of course, as the moths were all out and egg-laying partly over. This season by April 14th the larvæ were working in the canes in which they had wintered. While small they keep to the pith and may be found in all parts of the cane. Their work leaves a black tunnel through the centre of the cane, and the species may be recognized by this character of their tunnels. When full grown the larva spins a cocoon within the cane near an exit hole through the side previously cut by it. Shortly after the cocoon is spun the larva pupates. Often these pupæ wriggle from the cocoon and project, head foremost, from the opening, after the fashion of other Lepidopterous wood-boring species, thus enabling the moth to emerge without touching the wood. In many instances, however, the pupa-cases remain within the cocoons. In the laboratory cages the later stages are passed rapidly, and give little indication of the condition in the field. Larvæ pupated in the cages on the 1st of May, and emerged seven days later; but on this date, May 8th, the caterpillars outdoors were still feeding, and only a few even spinning cocoons. The first pupa was found outdoors on May 11th, and the greater number of the adults were flying during the third week in June. Mating and egg-laying take place at this time. The moths are extremely active, darting back and forth over the patch during the sunshine, but disappearing in cloudy weather. The eggs are laid on the canes, and the larvæ enter the canes and feed for the rest of the season, becoming perhaps two-thirds grown by winter time.

The injury to the canes appears in June, or late in May, usually about the time of pupation. The leaves wilt, turn yellow and fall, and the cane rapidly dies. Occasionally the canes survive the attack and bear fruit the following season. In these cases the old exit hole can be found in the side of the cane.

This insect is a very injurious pest, and quite capable of completely destroying a large plantation in a few years. The only method of control consists in rigidly destroying, *burning,* the diseased canes, as soon as they can be distinguished. Usually they are noticeable after, or even before, pupation, and can always be detected after pupation by the exit holes.

Our experience with this insect illustrates very well the value of clean culture in insect control. The moths appeared in the currants suddenly and in great numbers. They came from a row of old, neglected currants in a nearby orchard. They had bred in those canes, increasing in numbers, until finally there were no sound canes left. Then they took the shortest route to the currants first mentioned, about eight hundred yards away.

It is true of many of our injurious insects that a rigid system of clean culture is the cheapest and most effective method of control. Clean culture is a gospel well worth preaching. It would save our farmers and orchardists many thousands of dollars every year if rigidly practised; and the expense would be small. I know an apple orchard carefully sprayed and cared for, yet badly infested with apple pests every year. Why? Because just over the fence is a neglected orchard of perhaps fifty trees. These trees are worthless and absolutely uncared for. They serve, however, to breed apple insects for the whole neighbourhood. Clean culture even with us in Quebec is one of the most important factors in successful fruit-growing. In Ontario it is even more important, for here you have serious pests, the San José, and the bark-beetles, which we do not need, as yet, to consider.

Another currant borer, *Psenocerus supernotatus,* bred in considerable numbers in our canes this season. The beetles breed in the tips of the canes, and seem to do but little damage.

The Raspberry Cane-borer, *Oberea bimaculata,* was particularly numerous this season in raspberries. The adults appeared about June 20th, and were present in great numbers until the last of the month. Scores of specimens were picked from the canes during mid-day. Probably the same species breeds commonly here in wild raspberry and blackberry. Egg-cuts found here this season on roses may have been from *O. b. basalis,* a species which Mr. Morris, of Port Hope, has taken this season from rosebushes.

The Currant Saw-fly and the Currant Aphis were of course more or less common but easily controlled. I notice that currant growers seldom bother much about the late appearing larvæ of the former. Where these are killed the first brood of the succeeding season is usually few in numbers. The Currant Aphis appears to spread but slowly, at least with us. I have been watching it for three years now on a small group of canes where it is allowed to breed. Although it curls up practically every leaf on those bushes every season, it has so far caused no trouble in our plantation some thousand yards away.

The Grape-Vine Root-borer, *Fidia vitticida,* appeared in our vineyard three years ago in small numbers. The characteristic holes in the leaves were quite evident. Possibly our cold winters are too much for them for we have never seen the species since.

MISCELLANEOUS.

The Rust Fly, *Psila rosæ,* has appeared in Montreal Island, and threatens to render carrot raising a precarious business. It has long been a serious pest in the Maritime Provinces and in Eastern Quebec, but until recently has been rare with us. It is difficult to control, and I know of nothing better than the practice recommended by Dr. Fletcher, of spraying with kerosene emulsion every ten days from the time the carrots are thinned until four or five sprays have been given. The spray should soak the ground about the roots.

The Clover-root borer, *Hylastinus obscurus,* is widely spread throughout the Montreal region. Apparently it will soon allow but one good crop of clover in our neighborhood.

Red and Mammoth Clovers are seriously injured; and I find the beetles breeding also in Alsike and in Crimson Clover, but not to an injurious extent. They sometimes start their tunnels in White Dutch and Sainfoin, but I have not so far found them breeding there. Alfalfa and sweet clover are not affected here.

The beetles started their tunnels here this season in the last of May and first part of June. They cut an entrance hole either in the base of the crown or through the side of the root, and continue a cylindric tunnel down the root, sometimes near the surface, sometimes deeper into the tissue. Along the sides of the tunnel shallow niches, egg-niches, are cut, and in these the eggs are deposited, one in each niche. The larvæ bore irregularly through the substance of the root, and as the majority are working just below the crown the tissue is there often largely destroyed. The crown for this reason frequently breaks away from the root when an attempt is made to pull the plant. The first pupæ are formed the third week in July, and from this time until the first week in October pupæ are always to be found. On October 10th, this season, a very few pupæ were obtained, but nearly all had trans-

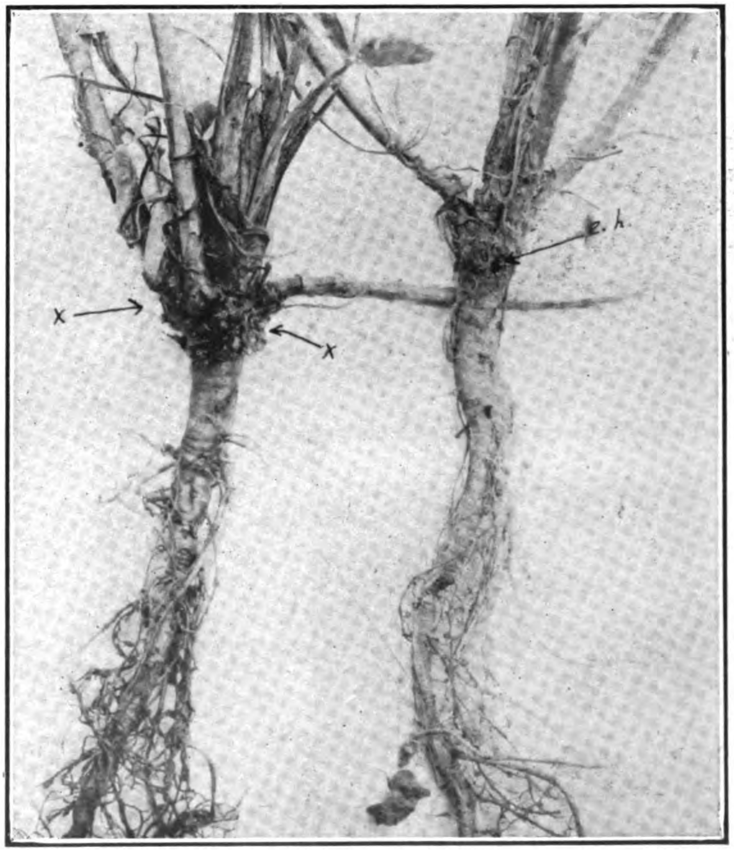

FIG. 20.
Hylastinus obscurus. Work in clover roots. *e.h.*, entrance hole; *x.*, borings of adult beetle. The crown would separate easily from the root.

formed. When these beetles are established in a section there is apparently no practical method of control. But this is perhaps not unfortunate for it is usually considered the best farm practice to take out one crop of clover from a rotation, and the first crop is not commonly affected seriously, although clover planted in May is sometimes attacked in numbers the following spring and the first crop injured. Plowing under the sod as soon as the first crop is cut should always be practised when this insect is common. Many of the larvæ can thus be destroyed.

The Cabbage maggot was more injurious this season than in other years, and the onion maggot was present though not in great numbers.

Anisota senatoria has been extremely numerous in the district between Howick and Hemingford. Many oaks through that country were completely stripped last season by hordes of these caterpillars.

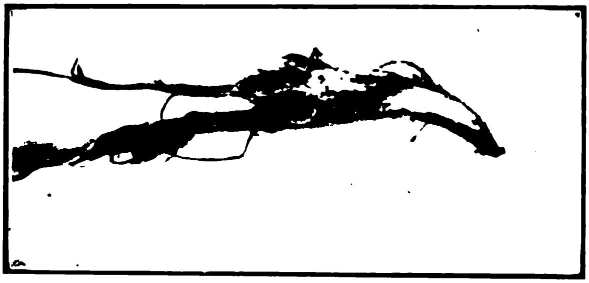

FIG. 21.
Hylastinus obscurus. Tunnel and eggs.

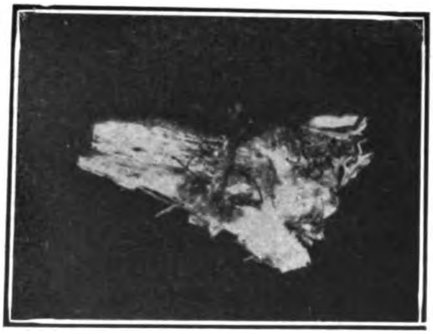

FIG. 22.
Hylastinus obscurus. Tunnel and eggs.

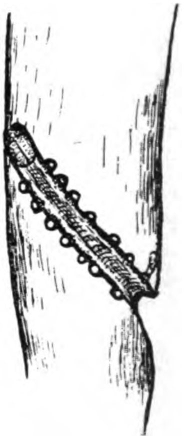

FIG. 23.
Hylastinus obscurus. **Eggs in the egg-niches, with adult beetle in the end of the egg-tunnel. (Twice enlarged.)**

Grasshoppers were not so serious a pest in this province as in the last three years, but still were very numerous in some localities. In sections where the grasshoppers were very destructive two or three years ago but were not numerous this season, the blister-beetles, whose young feed upon grasshopper eggs, were reported very plentiful. "Criddle mixture" and "Hopper-catchers" would save many dollars in the grass and grain fields of this province in grasshopper years. The Blister beetles mentioned above, mostly *M. unicolor,* were injurious in a few places. Their young, apparently, do much to control the grasshoppers, and the adults should not be destroyed unless they are really doing injury.

The Fall Web-worm which has been so abundant on shade and forest trees for several years seems to be decreasing in numbers. The White-marked Tussock, which was so injurious in Montreal recently, has not yet revived from the attack of its parasites.

Otiorynchus sulcatus has been doing considerable injury to cyclamen and primroses in two of the Montreal greenhouses. Injury was reported from the feeding of the adults on the flowers; and the larvae which live in the soil, destroyed the roots, and even fed upon the corms of the cyclamen. Carbon bisulphide has had no effect upon the larvæ. Probably carbolic acid emulsion or strong kerosene emulsion will be effective. We are not yet able to report any success in its control. Only two sets of greenhouses were affected so far as we know; others near by were not at all troubled.

The Apple-leaf hopper, so injurious here on potato and other crops in 1908 and 1909, was not numerous this season.

The Cucumber beetle, *D. vittata,* was again injurious throughout this district. It certainly seems to prefer squashes to melons and cucumbers; and can be effectively kept from the two last by having a few "trap plants" of squash growing close by. These "trap" squashes should be covered with Arsenite, dusted on in large quantity, as soon as the beetles appear, and at the same time the valuable crop should be sprayed with Bordeaux, which the beetles dislike. Many beetles can in this way be poisoned during the first few days of their feeding. By repeating the spray of Bordeaux on the main crop as often as needed, and leaving the "trap" squashes unsprayed the beetles can be kept away from the cucumbers and melons. The same method is effective in squash fields; a few plants being used as "traps" and the rest being covered with Bordeaux. For several years I have had squash, melons, cucumbers, and pumpkins growing close together. The squashes have always been attacked by the beetles, but the melons and cucumbers have escaped completely, and without treatment.

The Spruce Budworm, *Tortrix fumiferana,* was noticed in small numbers at Hudson. The Larch Sawfly, *N. erichsonii,* was present, but did little damage.

BASSWOOD OR LINDEN INSECTS. IV.

ARTHUR GIBSON, OTTAWA.

In 1904, the writer published, in the annual report of this Society, notes on 94 different species of insects which had been found attacking *Tilia americana* L. In 1906, notes on other species were contributed which brought the list up to 102, and, in 1907, a further paper increased this latter number to 122. The following additional notes have since been made.

ATTACKING THE FOLIAGE.

ORDER HOMOPTERA.

123. *Ceresa constans* Wlk. This insect has been found commonly on basswood at the Beaver Meadow, Hull, Que. in August and September, by Mr. W. Metcalfe. Mr. Van Duzee has also found the species on basswood near Buffalo, N. Y.

104 of 1906 list. *Telamona reclivata* Fitch. This species was collected on September 26, 1907, and again on Sept. 2, 1908. The 1906 specimens were taken on July 1.

124. *Cixius basalis* Van D. Beaver Meadow, Hull, Que. August 11, 1907, (Metcalfe.)

125. *Amalopota uhleri* Van D. Ottawa, Aug. 25, 1907, (Metcalfe.) This insect has been recorded as feeding on maple.

126. *Gypona albosignata* Uhl. Beaver Meadow, Hull, Que. Sept. 1, 1907, (Metcalfe.)

109 of 1906 list. *Diedrocephala coccinea* Forst. This species was abundant in 1905 but the specimens were not identified until 1907. (Det. by Heidemann.) Pupæ which were found on July 7, produced the perfect insects on July 10.

ORDER HEMIPTERA.

127. *Lygus tenellus* Uhl. MS. This species was collected by me from basswood on June 27, 1905, the determination being made by Mr. Van Duzee. In 1907, Mr. Metcalfe also found the same insect on linden at the Beaver Meadow, Hull, Que. on Aug. 11.

128. *Lygus monachus* Uhl. Mr. Metcalfe found this species commonly, at Ottawa, on basswood on July 1, 1904. In Miss Murtfeldt's account of this bug in Bulletin No. 13 of the U. S. Division of Entomology, the insect is stated to have been found infesting the growing points of young maples (*Acer dasycarpum.*). Besides maple, alder is also given as a food plant and "many other kinds of small trees and shrubs." The insect evidently has a wide range of food plants.

129. *Camptobrochis nebulosus* Uhl. Beaver Meadow, Hull, Que., Aug. 11, 1907, (Metcalfe). Box-elder and willow are also recorded as food plants for this insect, the former by Baker and the latter by Gillette.

ORDER LEPIDOPTERA.

19 of 1903 list. *Ennomos alniaria* L. In 1906, Mr. Young found the larva at Meach Lake, Que. This was the first record of its feeding on basswood in the Ottawa district. On Sept. 2, 1908, the writer found a mature larva which measured two and one-eighth inches long, also feeding on basswood, on the Experimental Farm.

130 *Pyrausta pertextalis* Led. Larvæ of this pyralid were found on basswood at Ottawa in June, 1908, the moths emerging June 27.

131. *Archips fractivittana* Clem. A single larva which produced this moth was found on basswood in 1908. It pupated on June 1, and the moth emerged on June 10. A brief note reads "larva like *rosaciana.*"

ORDER HYMENOPTERA.

67 of 1903 list. The Willow Sawfly, or American Cimbex, C. *americana* Leach. A single specimen of this larva was found by the writer feeding on basswood, at Ottawa, on October 8, 1907. This specimen, instead of being the usual pale yellow colour, was of a light vermilion shade.

ORDER ACARINA.

69 of 1903 list. The Linden Gall Mite, *Phytoptus abnormis* Garman. Very abundant at Ottawa in June 1908. Some leaves were much infested; quite a few of the galls were on the undersides of the leaves.

OCCURRING ON THE BARK.

ORDER HOMOPTERA.

132. *Lachnus dentatus* LeB. Specimens of apterous females, depositing eggs on basswood were shown at the annual meeting of this Society, at Guelph, on 31 Oct., and 1 Nov., 1907, by Dr. Bethune and Mr. Jarvis. This is probably the species which I found on the same tree at Ottawa a few years previously. In Packard's Forest Insects, the insect is mentioned as having been found on the branches of willow and also on small nursery apple trees.

133. *Pulvinaria vitis* Linn. This species is recorded from Western Ontario as occurring on *Tilia americana,* (Jarvis, Rep. Ent. Soc. 1907, p. 51). In Mrs. Fernald's Catalogue of the Coccidæ of the World the only food plant mentioned is grape vine.

134 *Toumeyella liriodendri* (Gmel.) Ottawa, (Jarvis, Rep. Ent. Soc. Ont., 1907, p. 51).

135. *Aspidiotus æsculi* Johns. Mr. Jarvis records this scale insect as infesting basswood at Toronto, Brantford and Guelph (Rep. Ent. Soc., 1907, p. 51). In Mrs. Fernald's Catalogue *Æsculus californica* is mentioned as the food plant and the habitat given as California.

136. *Aspidiotus diffinis* Newst. Mrs. Fernald records this species as occurring on basswood as well also as on lilac. Jarvis lists the species from basswood, from Guilds, Ont. (Rep. Ent. Soc. Ont., 1907, p. 51).

137. *Aspidiotus juglans-regiæ* Comst.

138. *Aspidiotus ulmi* John.

In April, 1907, Mr. J. Fred. Smith, late Provincial San José Scale Inspector, sent to the Division at Ottawa some basswood heavily infested with scale insects. The wood was taken from a tree near Beamsville, Ont. The material was sent to Dr. Howard, at Washington, and was reported upon by Mr. Marlatt as follows: "The scale insects on basswood from Mr. J. F. Smith are of two species, viz. *Aspidiotus juglans-regiæ* Comst. and *Aspidiotus ulmi* Johnson." *A. juglans-regiæ* has a wide range of food plants. Mrs. Fernald mentions walnut, apricot, apple, pear, peach, cherry, Japan plum, locust and maple. *A. ulmi* is recorded from elm, catalpa and *Cycas revoluta.*

THE ENTOMOLOGICAL RECORD FOR 1910.

ARTHUR GIBSON, OTTAWA.

The season of 1910 in Canada was, on the whole, a most favorable one for the collection of insects. Reports from many widely separated localities refer to the remarkably fine and dry weather. In the east, the season was much drier than that of 1909. From the many interesting records sent in, the year, too, has been an improvement with regard to the number of rarer forms which have been collected. As yet, of course, much material gathered in 1910, still remains to be worked up. As this is done a mention of the more interesting species, it is hoped, will be made in future issues of the Record. In the present Record are included notes on a number of rarer forms collected in other years, but only studied in 1910.

The compiler of the Record is exceedingly grateful to his many friends who have either helped him by sending in records for the "Notes of Captures", or in giving assistance in the identification of doubtful species.

Canadian collectors and students, as in previous years, have received invaluable help from the leading specialists in the United States and elsewhere. Particular acknowledgment is due to Dr. L. O. Howard, and his expert associates, Dr. H. G. Dyar and Mr. W. D. Coquillett, of Washington, D.C.; Dr. J. B. Smith, of New Brunswick, N.J.,; Sir George Hampson, of the British Museum; Mr. W. D. Kearfott, of Montclair, N.J.; Prof. H. F. Wickham, of Iowa City, Iowa; Mr. E. P. Van Duzee, of Buffalo, N.Y.; Mr. W. Beutenmuller, of New York, N.Y.; Dr. Henry Skinner, of Philadelphia, Pa.; Dr. E. M. Walker, of Toronto, Ont.; Col. Thos. L. Casey, of Washington, D.C.; Mr. Chas. Leibeck, of Philadelphia, Pa.; Rev. G. W. Taylor, of Departure Bay, B.C., Mr. C. H. Roberts, of New York, Mr. J. D. Evans, of Trenton, Ont., Mr. W. H. Harrington, of Ottawa, and Mr. F. H. Wolley-Dod, of Millarville, Alta. Mr. Dod is specializing in North American noctuidæ and will be pleased to name and return any specimens submitted to him.

LITERATURE.

Among the many valuable publications which have been received during the past year, and which are of interest to Canadian students, mention may be made of the following:—

BANKS, NATHAN. Catalogue of Nearctic Spiders. Smithsonian Institution, United States National Museum, Bulletin No. 72. This publication takes the place of the Marx Catalogue prepared some twenty years ago. The author states that the catalogue includes a little over 1,300 species. "The largest family is the Theridiidæ, with 298 species; the Attidæ is next with 213; two other families, the Lycosidæ and Epeiridæ, have over 100 species in each. Sixteen families have less than 10 species apiece." This work will be a most useful one. Many of the species occur in Canada,, but comparatively few definite records are available. The publication of this catalogue will undoubtedly lead to more systematic work, and it is to be hoped that entomologists in Canada will do their share in working up local species.

BEUTENMULLER, WILLIAM. The North American species of Neuroterus and their Galls, (issued May 20, 1910); The North American species of Aylax and their Galls, (issued May 20, 1910); The North American species of Aulacidea and their Galls, (issued July 16, 1910): American Museum of Natural History, New York. These papers are a continuation of the results of Mr. Beutenmuller's studies on American Cynipidæ and their Galls. They are very useful publications. The illustrations are particularly good: in fact they could not be otherwise, coming from the hand of Mrs. Beutenmuller. Several Canadian records appear in the above contributions.

BLATCHLEY, W. S. The Coleoptera or Beetles of Indiana; Department of Geology and Natural Resources; Bulletin No. 1, State Printers, Indianapolis; 1386 pages, with nearly 600 excellent illustrations. No book has appeared during the year which will give such general pleasure to entomologists as Professor Blatchley's magnificent work on the beetles of Indiana. Such a work has been much wanted, and although the author has confined it to the above State, it will, nevertheless, be of the greatest use to students in Ontario and other parts of Canada. Many of the species which occur in Indiana are to be found in Canada, and from the descriptions of families and genera and the keys to the genera and species and the descriptions thereof, students are now able to run down many insects which otherwise could only be determined by the specialist. Unfortunately the edition of this work is small, and many, doubtless, will be unable to obtain a copy.

CASEY, THOS. L. Memoirs on the Coleoptera, 1; New Era Printing Co., Lancaster, Pa.; issued September 24, 1910. This memoir, of 205 pages, by Col. Casey, the well-known student of coleoptera, is indeed an important publication. It is divided into 2 parts: 1—New species of the Staphylinid Tribe Myrmedoniini; 2—Synonymic and descriptive notes on the Pæderini and Pinophilini. Altogether 365 species are described as new, 25 of which are from Canada. Of these 25, all but two occur in British Columbia, and were mostly collected by the Rev. J. H. Keen, the enthusiastic naturalist, at Metlakatla. The two other species are from Ontario, one collected at Toronto and one at Ottawa. This further work on Staphylinid beetles will be of great interest to coleopterists. Such memoirs represent much close study, and the author deserves great credit for this additional contribution to the knowledge of these insects which are so difficult to study.

COQUILLETT, D. W. The Type-species of the North American Genera of Diptera. Proc. U. S. Nat. Museum, Vol. 37, pages 499-647; published August 4, 1910. "The great importance of knowing definitely what species is the type of any given genus is now recognized by practically every worker in the field of biology." This important contribution is the result of several years of work in ascertaining the types of the genera of diptera reported as occurring in North and Middle America. It contains all the genera known to the writer up to January 1, 1909, together with their type-species and synonymy. Students of diptera will find this publication of extreme value. In the *Canadian Entomologist* for November, 1910, Mr. Coquillett points out several corrections and omissions to the above paper, which should be noted by those who possess a copy of the article.

DIETZ, W. G. Revision of the Blastobasidæ of North America. Trans. Amer. Ent. Soc., Vol. xxxvi, Jan.-March, 1910, pp. 1-72, plates I.-IV. This interesting paper deals with 66 different species, several of which are recorded from Canada. Thirty-six are described as new. The author states in the beginning of the paper that "the Blastobasidæ, as now understood and distinguished from the Œcophoridæ, form a well defined family of the Tineina. This revision will be of much use to students of the microlepidoptera. Doubtless many others of the species listed will be found in Canada.

GROSSBECK, JOHN A. Studies of the North American Geometrid Moths of the Genus Pero. U. S. Nat. Museum, Vol. 38, pages 359-377, with Plates 13-16; published August 19, 1910. In this interesting paper Mr. Grossbeck gives the results of his investigation in the above named genus (= *Azelina* Guenee in part). Long series were gathered together from different parts of the United States and Canada, and four new species recognized. Four plates are added, one of these figures the adult moths, another structural characters and the remaining two show the genitalea of the species.

HAMPSON, SIR GEORGE F. (Bart.). Catalogue of the Lepidoptera Phalænæ in the British Museum, Vol. IX, Noctuidæ, 1910. 552 pp., plates cxxxvii to cxlvii. Received May 2. This volume "is the third and final part of the very large Noctuid subfamily *Acronyctinæ*: it contains 725 species belonging to 185 genera, as compared with 843 species belonging to 96 genera in Vol. VII, and 720 species belonging to 104 genera in Vol. VIII." Many of the species figured in the beautiful plates occur in Canada, and owing to the great care of the artist, in most instances, it is an easy matter to determine our North American forms. These volumes are eagerly looked forward to by lepidopterists. Vol. IX. is extremely interesting as it deals with many species which have of recent years been studied by American entomologists. Collectors in Canada should assist Sir George Hampson in his great work by sending him material from their respective districts. In this way, of course, future volumes will be made much more useful for those who are studying specially the lepidoptera of our country.

JOHANNSEN, O. A. The Mycetophilidæ of North America: Maine Agric. Exp. Station, Bull. 172, Part I, (March, 1910), pp. 209-276, plates 3; Bull. 180, Part II, (June, 1910), pp. 125-192, plates 4. This monographic treatment of the Fungus Gnats of North America is a most valuable contribution to our knowledge of diptera. In Part I the lower and economically less important subfamilies Bolitophilinæ, Mycetobiinæ, Diadocidiinæ, Ceroplatinæ and Macrocerinæ, are treated; in Part II the Sciophilinæ are dealt with.

KIRBY, W. F. A Synonymic Catalogue of Orthoptera, Vol. III, Locustidæ vel Acridiidæ; British Museum (Natural History), March, 1910. This volume completes Mr. Kirby's general Catalogue of the Order Orthoptera. It is a book of 674 pages, and therefore considerably larger than Vols. I and II. This is owing to the fact that the Locustidæ (the short-horned Grasshoppers or Migratory Locusts) is a much larger family than the others. This work will be of the greatest use to systematists, and now that the whole Catalogue has been completed, the order Orthoptera will doubtless attract more and more students from year to year. Pages 562 to 586 are given up to " Additions and Corrections " to the three volumes.

MUTTKOWSKI, RICHARD A. Catalogue of the Odonata of North America: Bulletin of the Public Museum of the City of Milwaukee, Vol. I, article I, pp. 207. This well prepared catalogue, which was issued on June 27th, is a publication which will be widely welcomed by students of the Odonata. Such a catalogue has been much wanted. It presents in convenient form what purports to be a complete list of these insects from the North American region. The author has had the cooperation of the leading students in this order in the preparation of the catalogue; the classification and nomenclature employed, therefore, represents the more approved and advanced ideas of odonatologists. The publication is an important one, and should be in the hands of all Canadian students of these neuropteroid insects.

PIERCE, W. DWIGHT. A Monographic Revision of the Twisted Winged Insects comprising the Order Strepsiptera Kirby. Smithsonian Institution: U. S. Nat. Museum, Bulletin 66. Received Jany. 7, 1910. In this extensive contribution of 232 pages, 37 genera are treated of, comprising 103 species. Sixty-two new species are described from North America. The introductory chapters on " History " and " Biology " give much information about these interesting insects, which have been so little studied by North American students. Fifteen plates appear at the end of the Bulletin.

ROHWER, S. A. On a Collection of Tenthredinoidea from Eastern Canada. Proc. U. S. Nat. Museum, Vol. 38, pages 197-209; published June 6, 1910. This paper is a report of an interesting collection of sawflies made by Mr. A. Gordon Leavitt, in the County of St. John, New Brunswick. Fifty-three different species are listed, 12 of which are described as new.

SMITH, JOHN B. A List of New Jersey Insects: Annual Report of the New Jersey State Museum, 1909; pp. 888. This report, with the exception of 13 pages, is devoted to Dr. Smith's New List of the Insects of New Jersey. No less than 10,385 different species are listed, comprising 3,486 genera and 331 families. In the 1899 list 8,537 species were included. Considerable progress has therefore been made in a knowledge of the insects of the State. This List is an extremely useful publication. Unfortunately its edition is limited, and it will be impossible to supply everyone who will want this work with a copy.

Snodgrass, Robert Evans. The Thorax of the Hymenoptera. Proc. U. S. Nat. Museum, Vol. 39, pages 37-91, with plates 1-16; published October 25, 1910. In this paper the author gives much extremely useful information on the thorax of hymenopterous insects. In such a study it was necessary, of course, to make many dissections and drawings. The reproductions of these latter are particularly good. In addition to the 77 figures on the plates, 16 other figures appear in the text.

Wheeler, William Morton. Ants: Their Structure, Development and Behavior. New York: The Columbia University Press, 1910. This remarkable book of 663 pages is one of the most important contributions to the literature of entomology which has appeared during the year. It is a work that has been much wanted and will be of extreme value the world over. The book is divided into thirty chapters, each of which contains a number of parts. Chapter I treats of "Ants as Dominant Insects." This is followed by chapters on external and internal structure, development, polymorphism, history of myrmecology and classification of ants, distribution, fossil ants, etc. At the end are several appendices: A—Methods of Collecting, Mounting and Studying Ants; B—Key to the subfamilies, genera and subgenera of the North American Formicidæ, for the identification of the workers; C—A list of described North American ants; D—Methods of exterminating noxious ants; E—Literature. Beautiful illustrations appear throughout the text. This magnificent work will undoubtedly lead many to make serious studies of these most interesting insects, about which so much reliable information has now been made readily available.

Williamson, Edward Bruce. The North American Dragonflies (Odonata) of the Genus Macromia. Proc. U. S. Nat. Museum, Vol. 37, pages 369-398, with plates 35-36; received 7 Jany., 1910. This paper on the genus Macromia will be of much value to students of dragonflies. The American species are distributed generally over the United States and Southern and Eastern Canada. Nine species are treated of at length, three of which are described as new. Seven figures, showing wing venation, are included in the text.

The following is a list of names and addresses of collectors heard from during 1910:—

Anderson, E. M., Provincial Museum, Victoria, B. C.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., care King Brothers, Quebec, Que.
Bush, A. H., 1105 Ninth Ave., Vancouver, B.C.
Carr, F. S., Edmonton, Alta.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kaslo, B.C.
Crew, R. J., 561 Carlaw Ave., Toronto.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Dod, F. H. Woolley-, Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fyles, Rev. T. W., Hull, Que.
Gibson, Arthur, Experimental Farm, Ottawa.

Groh, H., Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Haight, D. H., Sudbury, Ont.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harms, J. F., Treesbank, Man.
Harrington, W. H., P.O. Department, Ottawa.
Heath, E. F., Cartwright, Man.
Hewitt, Dr. C. Gordon, Experimental Farm, Ottawa.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph.
Keen, Rev. J. H., Metlakatla, B.C.
Leavitt, A. G., St. John, N.B.
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancover, B.C.
McIntosh, W., St. John, N.B.
Metcalfe, W., 288 Bank Street, Ottawa.
Moore, G. A., 850 St. Hubert St., Montreal.
Moore, W. H., Scotch Lake, N.B.
Morris, Frank, Port Hope, Ont.
Nelles, Douglas H., Dept. Interior, Ottawa.
Nicholls, A., 18 Electric Street, Ottawa.
Perrin, Jos., McNab's Island, Halifax, N.S.
Rowland, Alton, Windsor Mills, Que.
Russell, John, Hope Station, B.C.
Sanders, G. E., Experimental Farm, Ottawa.
Sanson, N. B., Banff, Alta.
Saunders, Henry, 21 Harbord Street, Toronto.
Sherman, R. S., 2285 Sixth Avenue, Vancouver, B.C.
Simpson, W., Dominion Observatory, Ottawa.
Southee, G. R., Sherbrooke, Que.
Swaine, J. M., Macdonald College, Que.
Taylor, Rev. G. W., Departure Bay, B.C.
Tipping, E. Dalton, Minnehik P.O., via Bluff Centre, Alta.
Treherne, R. C., Grimsby, Ont.
Venables, E. P. Vernon, B.C.
Walker, Dr. E. M., Biological Dept., Univ. of Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Willing, T. N., Saskatoon, Sask.
Winn, A. F., 32 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O. A. C., Quelph, Ont.

NOTES OF CAPTURES.

LEPIDOPTERA.

(Arranged according to Dyar's List of North American Lepidoptera, U.S. N.M. Bull. No. 52).

(Dyar's number).

14. *Papilio thoas* L. Toronto, a fine specimen seen at the corner of Queen and Yonge Streets, July 2, (Crew).

64. *Eurymus boothii* Curtis. Dawson, Y.T., 1908, (A. Day).

95. *Speyeria idalia* Dru. Toronto, end August, (J. R. McMurrich). First record for this district.

131. *Brenthis myrina* Cram. A remarkable melanic specimen of this common butterfly was taken at Hull, Que., Aug. 8, by Dr. Fyles. The forewings are almost entirely suffused with black, very little red.

185. *Charidryas nycteis* D. & H. East Toronto, near Golf Links, August, (J. R. McMurrich.) This is another remarkable aberration in which the central large band across the wings is entirely white, not yellow as is usual.

282. *Coenonympha kodiak* Edw. a. *yukonensis* Holland. Dawson, Y.T., 1908, (A. Day).

284. *Coenonympha typhon* Rott. a. *laidon* Bork. Belleville, Ont. (Miss M. C. Melburn).

289 *Œneis macounii* Edw. Hymers, Ont., June 9, (Dawson).

295. *Œneis norna* Thunb. f. *taygete* Hbn. Dawson, Y.T., 1908, (A. Day).

378. *Incisalia niphon* Hbn. Hudson, Que., May 5, (Winn).

419 *Nomiades couperii* Grt. Sherbrooke, Que., June 4, (Southee).

430. *Rusticus shasta* Edw. Lethbridge, Alta., July 5, (Wallis).

440g *Cyaniris ladon* Cram. g. *piasus* Bdv. Bird's Hill, Winnipeg, Man., June 5, (Wallis).

656a. *Hemaris ruficaudis* Kirby. Edmonton, at sallow blossoms, May 13, (Carr), new to Alberta. I have the same form from Field, B.C., and from Chicago, and it is the *thysbe* of Holland's figure, with the marginal band even instead of dentate, and seems to be the *ruficaudis* of Smith's Monograph, (Dod).

657. *Lepisesia flavofasciata* Wlk. Sudbury, Ont., June 7, (Haight).

699. *Phlegethontius convolvuli* L. a. *cingulata* Fab. Ottawa, no date, (Bro. Germain). First record for the district.

713. *Sphinx canadensis* Bdv. Britannia, near Ottawa, July 19, (Groh).

741. *Samia columbia* Smith. Dryden, Ont., June 6, (McNicol & Pitt).

778. *Eacles imperialis* Dru. In addition to the captures recorded in the Ottawa Naturalist, Aug. 1910, 2 other specimens were collected at Ottawa, one on July 7, and the other at end of July, (W. Gibson). Mr. Grant also took 3 specimens at Orillia, Ont.

853. *Estigmene prima* Slosson. Several specimens of this rare moth were taken the past season in widely different localities: Shawbridge, Que., June 4, (Winn); Ottawa, (Nicholls); Sudbury, Ont., June 16, (Haight); Winnipeg, Man., June 2, (Wallis).

867. *Neoarctia brucei* Hy Edw. Mt. Cheam, B.C., Aug. 12, 1907, (Bush). First Canadian record that I know of.

876. *Apantesis michabo* Grt. Aweme, Man., May 27, (Criddle); var. *minea,* Hymers, Ont., June 7, (Dawson).

911. *Euchaetias oregonensis* Stretch. Ottawa, no date, (Nicholls), first record for district; Maynooth, Ont., June 18, rare in my experience, (Evans).

958. *Panthea portlandia* Grt. Banff, Alta., June 1, (Sanson). A Banff male, dated July 16, is in Prof. Smith's collection. Both are rather dark. New to Alberta, (Dod).

960. *Panthea acronyctoides* Wlk. Montreal, May 21, (Winn).

964. *Charadra deridens* Gn. Aweme, Man. June 28, (Criddle; Winnipeg, June 17, (Wallis). Rare in Manitoba.

Apatela cyanescens Hamp. Cowichan Lake District, B.C., 1 specimen, June 22, 1908, (Day).

974. *Apatela hesperida* Sm. Aweme, Man., June 28, Criddle).
992. *Apatela lætifica* Sm. Winnipeg, Man., June 17, (Wallis).
1001. *Apatela spinigera* Gn. Winnipeg, Man., June 17, (Wallis).
1005. *Apatela lithospila* Grt. Worthington, Ont., near Sudbury, July 6, (Haight).
1008. *Apatela funeralis* Grt. Ottawa, June 14, (Nicholls).
1010. *Apatela minella* Dyar. Winnipeg, June 15, (Wallis).
1097. *Platyperigea præacuta* Sm. Duncans, B.C., July 15, not previously recorded from Vancouver Island, (Hanham).
1101. *Caradrina meralis* Morr. Duncans, B.C., Aug. 25, not previously recorded from Vancouver Island, (Hanham); Trenton, Ont., Sept. 2, (Evans).
1109. *Caradrina miranda* Grt. Victoria, B.C., July 5, not previously recorded from Vancouver Island, (Hanham).
1149. *Hadena bridghami* G. & R. Rimouski Wharf, Que., Aug., (Gibb).
1189. *Hadena barnesii* Sm. Banff, Alta., July 30 to Aug. 4, not rare, (Sanson). This is the species so standing in my Alberta list. It seems almost, but not quite, to connect with *sora*.. Typical *barnesii* from Colorado is smaller and brighter coloured than either, (Dod).
1199. *Hadena versuta* Sm. Hymers, Ont., June 20-28, (Dawson).
1202. *Hadena miseloides* Gn. Winnipeg, June 17, (Wallis).
1210. *Hadena niveivenosa* Grt. Hymers, Ont., Aug. 7, 1909, (Dawson).
1221. *Hadena apamiformis* Gn. Winnipeg Beach, Man., July 5, (Wallis); Hymers, Ont., July 7, (Dawson).
1217. *Hadena remissa* Hbn. Duncans, B.C., May 23, not previously recorded from Vancouver Island, (Hanham).
1223. *Hadena morna* Strk. Duncans, B.C., Aug. 2, a rare species, (Hanham). The record of this species from High River in the Record for 1909 is wrong. The name was probably given by me, as the species stands as *morna* in Hampson's Catalogue, though erroneously. It is the *Orthosia conradi* Grt. of the Alberta List, and is either a local race or close ally of that species. Prof. Smith has described it as new under the name of *Agroperina lineosa* in Jour. N. Y. Ent. Soc., xviii, 145, Sept., 1910, (Dod).
1226. *Hadena cogitata* Sm. McNab's Island, near Halifax, N.S., June 30, (Perrin).

Hadena enigra Sm. Winnipeg, June 24, (Wallis).

Hadena multicolor Dyar. Duncans, B.C., June 2-29, (Hanham).

Hadena bonilla Barnes. Metlakatla, B.C., Aug. 6, 1904, (Keen).

Hadena sora Sm. Banff, Alta., July 16 to 22, three specimens, (Sanson).

1259. *Polia epichysis* Grt. Victoria, B.C., Aug. 24, not previously recorded from Vancouver Island, (Hanham).

Trachea jocasta Sm. Cartwright, Man., Sept 5, (Heath).

1356. *Oncocnemis barnesii* Sm. Banff, Alta., one worn female, Oct., 17, (Sanson). It agrees pretty closely with the description and with Hampson's figure, copied from a figure of the type from Yellowstone Park. The specimen is unlike any other species known to me, and a most interesting new Alberta record, (Dod).
1393. *Rhynchagrotis anchocelioides* Gn. Duncans, B.C., 1 sp. bred, July 5, not previously recorded from Vancouver Island, (Hanham).
1405a. *Rhynchagrotis formalis* Grt. a. *falcula* Grt. Winnipeg, Aug. 31, a surprising capture, (Wallis).

1421. *Platagrotis imperita* Hbn. Banff, Alta., 4 specimens, July 30 to Aug. 4, (Sanson); Calgary, Alta., July 23, 1908; Didsbury, Alta., Aug. 5, 8, 1905, (C. G. Garrett). I have a Labrador specimen from Prof. Smith's collection, and a B.C. specimen, probably from the Okanagan, is in the British Museum. It appears to be the *imperita* of Hampson's Catalogue. First Alberta records, (Dod).

1426. *Semiophora elimata* Gn. Banff, Alta., July 25, (Sanson). New to Alberta.

1449. *Setagrotis vernilis* Grt. Banff, Alta., July 30, (Sanson). A very dark specimen, but I think this species. New to Alberta, (Dod).

Setagrotis filiis Sm. (Trans. Amer. Ent. Soc. xxxiii, 125, April, 1907). Banff, Alta., Sept 1. The type is from Pullman, Wash.; a female from Laggan, Alta., Aug. 9, is in Prof. Smith's collection. I do not feel sure that it is not merely a very dark blue-grey form of *infimatis.* A new Alberta record, at any rate, (Dod).

1486. *Noctua oblata* Morr. Barrington Passage, N.S., July 5, (Young).

1544. *Feltia gladiaria* Morr. Trenton, Ont., Sept. 13, second specimen taken, (Evans).

1581. *Paragrotis olivalis* Grt. Duncans, B.C., rare, 1 at sugar, Aug. 15, and another at rest, Sept. 5, (Hanham).

1588. *Paragrotis brocha* Morr. Duncans, B.C., at sugar Sept. 15, 1908, not taken since, (Hanham).

1623. *Paragrotis personata* Morr. Rounthwaite, Man., (Marmont); Aweme, Man., July 13, 1904; Aug. 25, 1905 (Fletcher). See Ottawa Naturalist, Sept. 1910.

1639. *Paragrotis vallus* Sm. Banff, Alta., Sept. 8, (Sanson). The type is a female from Laggan. I have a female taken at Millarville on Oct. 5, 1907, which I had believed to be the female of *vulpina,* of which I have seen males only. Mr. Sanson's specimen is a male, and indicates a distinct species from *vulpina,* (Dod).

1682. *Paragrotis fuscigera* Grt. The species referred to by me under this name in the Record for 1909, turns out to be *pestula* Smith, which is an ally of *pleuritica* Grt. and distinct from *focinus* Smith, to which I have referred it, (Dod).

1692. *Paragrotis intrita* Morr. Winnipeg Beach, Man., Aug. 19-24, four specimens, (Wallis). Smaller only than Vancouver Island specimens of which I have a long series. I believe *strigilis* Grote, *titubatis* Smith and *reuda* Strecker, to be variations of *intrita,* and have specimens compared with all the types except *reuda,* which I overlooked. The "*intrita*" of my Alberta list is another species, and so have been all previous Manitoba records of any of the above names that I have been able to investigate, (Dod).

Paragrotis esta Sm. Duncans, B.C., Aug. 16, 1907, (Day).

1693. *Paragrotis mollis* Walk. Millarville, July 5, (Dod).

1703. *Paragrotis basiflava* Sm. Banff, Alta., Aug. 19, (Sanson). This was described from "N. W. B. C." *Compressipennis* was described from Yosemite, B.C., The types are identical, (Dod).

1734. *Paragrotis colata* Grt. Banff, Alta., July 22, (Sanson). Mrs. Nicholl took a specimen at 8,000 feet, on Wilcox Peak, near the head waters of the Saskatchewan, which is in the British Museum, and which I have compared with the type there from Mt. Hood, Oregon. The species resembles a dark *mollis,* (Dod).

1745. *Paragrotis silens* Grt. Rimouski Wharf, Que., Aug., a new locality, (Gibb).

1773. *Mamestra nimbosa* Gn. Duncans, B.C., at sugar, middle July, rare here, (Hanham).

1792. *Mamestra atlantica* Grt. This species does not appear to be included in our British Columbia list; I have one specimen labelled Victoria, (Hanham).

1805. *Mamestra congermana* Morr. McNab's Island, near Halifax, N.S., July 28, (Perrin); Winnipeg, June 15, 17; 2 females, (Wallis). Holland's figure under this name is *artesta* Smith. Sir George Hampson places them in different genera upon characters which are well marked, (Dod).

1806. *Mamestra rubefacta* Morr. McNab's Island, N.S., June 3, (Perrin); Winnipeg Beach, June 17, (Wallis).

1809. *Mamestra pulverulenta* Sm. Banff, Alta., (Sanson). *Pulverulenta* was described without locality, as a variety of *assimilis* Morr., and the Banff specimen agrees with the description, though I have seen the type of neither form. The "*assimilis*" of the Kaslo list is the same species. *Assimilis* is a black species common at Calgary, and I have seen it from Banff also. *Pulverulenta* is dark fuscous, powdery. I am under the impression that they are two species, (Dod).

1813. *Mamestra variolata* Sm. Victoria, B.C., July 15, only record, (Hanham).

1840. *Mamestra sutrina* Grt. Duncans, B.C., 2 at sugar, June 8, 12, a rare species in B.C., (Hanham).

1876. *Mamestra negussa* Sm. Winnipeg, Man., May 30, (Wallis).

Mamestra acutermina. Winnipeg, July 13, (Wallis).

1882. *Barathra curialis* Sm. Edmonton, June 17. New to Alberta, (Carr teste Dod).

2048. *Stretchia plusiiformis* Hy Edw. Hymers, Ont., May 15, (Dawson). First Ontario record.

2070. *Cleoceris rectifascia* Sm. Duncans, B.C., July 18, (Hanham).

Pleroma conserta Grt. Banff, Alta., April 25, and May 7, (Sanson). The type is from the State of Washington and is largely suffused with black. That of *apposita* Smith is from Victoria, B.C., and is similarly suffused. Sir George Hampson treats them as the same species, I think correctly. Mr. Sanson also took a form without the black suffusion, which I believe to be the same species, (Dod).

Pleroma cinerea Sm. Duncans, B.C., late Oct., (Hanham).

2086. *Xylina hemina* Grt. Hymers, Ont., Sept. 4, (Dawson).

Cucullia indicta Sm. Millarville, Alta., June 5 and 11, (Dod).

2148. *Bellura diffusa* Grt. Barrington Passage, N.S., July 12, (Young).

2171. *Papaipema cerina* Grt. Winnipeg, Sept. 15, (Wallis).

2190.1. *Papaipema insulidens* Bird. Duncans, B.C., at light, Aug. 21, 1908, (Day).

2199. *Xanthia flavago* Fab. Waswanipi River, Hudson Bay Slope, Aug. 1896, (Dr. R. Bell).

2210. *Pseudoglœa blanda* Grt. Duncans, B.C., Sept. 18, 1907, (Day).

2244. *Scopelosoma devia* Grt. Duncans, B.C., 1 specimen at sallow, March 26; *tristigmata* is, I believe, the only species previously recorded from British Columbia, (Hanham).

2280. *Pippona bimatris* Harv. Treesbank, Man., July 20, (Wallis).

2341. *Schinia acutilinea* Grt. Calgary, Alta., town lights, Aug. 8, (Hudson). Agrees with Hampson's figure of type from Colorado, and is like my specimens from Glenwood Springs. Apparently a new record for Canada, (Dod).

Autographa V-alba Ottol. Banff, Alta., Aug. 19, (Sanson). The specimen is a female and agrees with Ottolengui's figure of the type in all except the sign, which is more like the sign in his figure of *surena,* though not nearly as wide. It can be no other known species than *V-alba,* and the sign probably varies to that extent, (Dod).

2509. *Autographa selecta* Wlk. Banff, Alta., Aug. 4 to 19, (Sanson). Walker's type has the subterminal line waved, rather than dentate, as in Grote's type of *viridisignata.* Autographas do not usually vary that way, and the character may prove to be of specific value. *Viridisignata* is the common form, though the sign is not always green. Mr. Sanson has both forms. The first Alberta records, (Dod).

2514. *Autographa celsa* Hy. Edw. Ucluelet, B.C., Aug. 20, 1909, (Young).

2526. *Autographa speciosa* Ottol. Duncans, B.C., July 12, 1907, (Day).

Autographa sansoni Dod. Banff, Alta., June 10, (Sanson).

2548. *Pæctes oculatrix* Gn. Winnipeg, June 15, (Wallis).

2784. *Syneda alleni* Grt. Orillia, Ont., (Grant).

2819. *Catocala obscura* Strk. Ottawa, (Nicholls). First record for district.

2858. *Catocala coccinata* Grt. "E. Ont., Can.," (Evans).

2871. *Catocala subnata* Grt. Belleville, Ont., (Evans).

2886. *Catocala cœlebs* Grt. Belleville, Ont., (Evans).

2890. *Catocala whitneyi* Dodge. Stony Mt., Man., Aug. 11, (Chaplin & Wallis).

Catocala caerulea Beut. Penticton, B.C., Aug. 11, 1909, (Wallis). First record for Canada, hitherto known from Oregon.

3125. *Symmerista albifrons* S. & A. Montreal West; moths in great abundance on tree trunks, June 19, not a trace of larvæ in August, (Winn).

3165. *Fentonia marthesia* Cram. Orillia, Ont., (Grant).

3176. *Pseudothyatira cymatophoroides* Gn. Edmonton, July 1, (Carr). New to Alberta, (Dod).

3180. *Euthyatira pudens* Gn. Winnipeg, May 20, (Wallis).

3226. *Oreta rosea* Wlk. Montreal, Aug. 19, taken at rest in city. First time I have taken it here, (Winn).

3227. *Oreta irrorata* Pack. Rimouski Wharf, Que., (Gibb).

Tephroclystis russeliata Swett. St. Fabien, Rimouski Co., Que., July, (Chagnon).

3455. *Petrophora algidata* Mosh. Westbourne, Man., July 30, 1908, (Wallis).

3476. *Mycterophora slossoniæ* Hulst. Winnipeg, Man., July 23, 1908, (Wallis). In identifying this specimen Mr. Grossbeck reports: "Dr. Dyar says this is a noctuid, and apparently he is correct."

3545. *Eois persimilis* Hulst. Winnipeg, Man., June 27, 1908, (Wallis). A rare species.

3657. *Sciagraphia hebitata* Hulst. Banff Alta. June 23, 1909, (Wallis).

3693. *Cymatophora flavicaria* Pack. Yukon, collected on wagon road, between White Horse and Dawson, (R. Stewart).

3876. *Apocheima rachelæ* Hulst. High River, Alta., March 12, (Baird).

Cingilia rubiferaria Swett. Montreal, Sept. 28, 1905, (Chagnon).

3902. *Sicya macularia* Harr. "Nordenskiold", Yukon Territory, Aug. 21, 1908, (R. Stewart).

3963. *Euchlæna astylusaria* Walk. Millarville, Alta., May 31, (Dod).

3991. *Priocycla decoloraria* Hulst. St. John's, Que., July 1, 1906, (Chagnon).

4095. *Cochlidion rectilinea* G. & R. Trenton, Ont., July 12, (Evans).

4142. *Cossus centerensis* Lint. Hymers, Ont., June 27, (Dawson)

4148. *Prionoxystus macmurtrei* G. M. Port Hope, Ont., June 21, 1896, (Metcalfe).

4210. *Sesia morula* Hy. Edw. Aweme, Man., 2 specimens, July 20, 21, (Criddle). Apparently the first Canadian record.

4622. *Argyria auratella* Clem. St. John's, Que., July 12, (Chagnon).

4658. *Tetralopha militella* Zell. Rigaud, Que., July 28, (Chagnon).

4693. *Acrobasis betulella* Hulst. Mt. St. Hilaire, Que., July 1, (Chagnon).

4694. *Acrobasis comptoniella* Hulst. Mt. St. Hilaire, Que., July 1, (Chagnon).

4711. *Dioryctria abietella* D. & S. Montreal, July 25, (Chagnon).

4723. *Glyptocera consobrinella* Zell. Mt. St. Hilaire, Que., June 27, (Chagnon).

4734. *Nephopteryx ovalis* Pack. Mt. St. Hilaire, Que., July 2, (Chagnon).

4746. *Meroptera pravella* Grt. Mt. St. Hilaire, Que., July 5, (Chagnon).

4748. *Meroptera unicolorella* Hulst. Mt. St. Hilaire, Que., June 27, (Chagnon).

4759. *Salebria contatella* Grt. St. John's Que., July 1, (Chagnon).

4776. *Laodamia fusca* Haw. Mt. St. Hilaire, Que., Sept. 1, (Chagnon).

4843. *Canarsia ulmiarrosorella* Clem. Mt. St. Hilaire, Que., July 6, (Chagnon).

4870. *Homæosoma stypicellum* Grt. Mt. St. Hilaire, Que., July 6, (Chagnon).

4939. *Platyptilia acanthodactyla* Hbn. Trenton, Ont., Sept 13, 1908, (Evans).

5049. *Olethreutes duplex* Walsm. Ottawa, leaf roller on poplar, May, 1908, (Gibson).

5131. *Eucosma nisella* Clerck. Trenton, Ont., Aug. 26, 1908, (Evans).

5207. *Episimus argutanus* Clem. Trenton, June 13, (Evans).

Proteoteras crescentana Kearf. Winnipeg, Man., (Wallis); Regina, Sask., July, (Willing). Larvæ probably in stem galls on box elder, (W. D. K.).

5261. *Ancylis goodelliana* Fern. Trenton, July 25, 1908, (Evans).

5287. *Ecdytolopha insiticiana* Zell. Trenton, June 18, Aug. 14, (Evans).

Sparganothis tristriata Kearf. Ottawa, June 27, 1908, (Gibson). A rare species.

5371. *Archips fractivittana* Clem. Chelsea, Que., emerged June 10, 1908, (Gibson); Montreal, June, (Chagnon).

Tortrix alleni Fern. Trenton, 3 dates, July 1-July 6, (Evans).

5419. *Eulia quadrifasciana* Fern. Trenton, 4 dates, June 25-July 17, (Evans).

5452. *Phalonia bunteana* Rob. Trenton, July 4, (Evans).

Hysterosia baracana Busck. Trenton, July 11, (Evans).

5504. *Plutella porrectella* L. Trenton, June 14, 1904, (Evans).

5579. *Aristotelia fungivorella* Clem. Trenton, June 28, (Evans).

5595. *Eucordylea atrupictella* Dietz. Trenton, July 18, (Evans).

5655. *Trichotaphe flavocostella* Clem. Trenton, July 4, (Evans).

5769. *Gelechia rileyella* Chamb. Trenton, (Evans).

5870. *Depressaria nebulosa* Zell. Sudbury, Ont., (Evans).

6010. *Coleophora spissicornis* Haw. Trenton, 13 dates, June 20-Sept. 24, (Evans).

6048. *Coleophora tiliæfoliella* Clem. Ottawa, case on basswood, Sept. 24, (Gibson).

6096. *Lymnæcia phragmitiella* Stainton. Trenton, 2 specimens, July 14, 1906, July 16, 1907, (Evans).

Mompha stillella Busck. Trenton, Sept. 19, 1906, (Evans).

6282. *Lithocolletes sexnotella* Chamb. Trenton, 5 specimens, June 13-July 9, 1908, (Evans).
6306. *Lithocolletes guttifinitella* Clem. Halifax, N.S., Sept., larvæ mining the upper surface of *Rhus toxicodendron,* (A. H. Mackay).
Lithocolletes hamameliella Busck. Halifax, N.S., Sept., larvæ mining leaves of *Hamamelis virginica,* (A. H. Mackay).
6496. *Tinea bimaculella* Chamb. Trenton, June 20, (Evans).
6497. *Tinea canariella* Clem. Trenton, July 2, (Evans).
6534. *Amadrya effrenatella* Clem. Trenton, July 29, (Evans).
6537. *Diachorisia velatella* Clem. Trenton, July 22, (Evans).
6606. *Sthenopis thule* Strk. Ottawa, at light, (Nicholls). Second specimen taken in this district.
6609. *Hepialus mustelinus* Pack. Hymers, Ont., July 7, (Dawson).

COLEOPTERA.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico).

178. *Notiophilus sibiricus* Mots. Vicinity of Stewart River, Y. T., (Nelles).
411. *Bembidium acutifrons* Lec. Winnipeg, Man., May 14, 1909, (Wallis).
413. *Bembidium cautum* Lec. Winnipeg, Man., May 14, 1909, (Wallis).
558. *Pterostichus scitulus* Lec. Lethbridge, Alta., July 5, 1909, (Wallis).
564. *Pterostichus sayi* Brulle. Deseronto, Ont., Sept. 25, 1 specimen, the only one I have ever taken, (Evans).
587. *Pterostichus patruelis* Dej. Vicinity of Stewart River, Y.T., (Nelles).
636. *Amara brunnipennis* Dej. Fullerton, Hudson Bay, July 5, 1904, (Halkett).
813. *Platynus perforatus* Lec. Vicinity of Stewart River, Y.T., (Nelles).
1157. *Bradycellus cordicollis* Lec. Winnipeg, Man., May 14, (Wallis).
1225. *Haliplus cribrarius* Lec. Winnipeg Beach, Man., Sept. 6, (Wallis).
1226. *Haliplus ruficollis* DeG. Winnipeg Beach, Man., June 12; Peachland, B. C., July 28, 1909, (Wallis).
1227. *Haliplus longulus* DeG. Winnipeg, June 5, (Wallis).
1228. *Cnemidotus callosus* Lec. Peachland, B.C., Aug. 18, (Wallis).
1233. *Cnemidotus edentulus* Lec. Winnipeg Beach, Man., June 12, (Wallis).
1275. *Bidessus affinis* Say. Winnipeg, May 27, (Wallis).
1285. *Cœlambus punctatus* Say. Winnipeg Beach, Man., June 12; Peachland, July 31, (Wallis).
1289. *Cœlambus turbidus* Lec. Winnipeg, May 1, (Wallis).
1290. *Cœlambus lutescens* Lec. Winnipeg, April 13, (Wallis).
1293. *Cœlambus sellatus* Lec. Peachland, B.C., Aug. 18, (Wallis).
1297. *Cœlambus nubilus* Lec. Winnipeg, June 19, (Wallis).
1302. *Cœlambus impressopunctatus* Sch. Winnipeg, April 13, (Wallis.
1303. *Deronectes depressus* Fab. Winnipeg Beach, Man., June 12, (Wallis).
1306. *Deronectes striatellus* Lec. Peachland, B.C., July 27, (Wallis).
1320. *Hydroporus consimilis* Lec. Winnipeg Beach, June 12, (Wallis).
1338. *Hydroporus septentrionalis* Gyll. Peachland, B.C., July 27, (Wallis).
1340. *Hydroporus rivalis* Gyll. Peachland, B.C., July 27, (Wallis).
Hydroporus rusticus Sharp. Winnipeg, April 13, (Wallis). Mr. Roberts considers this to be a good species.
1352. *Hydroporus tristis* Payk. Winnipeg, May 1, (Wallis).

1354. *Hydroporus rufinasus* Mann. Winnipeg, May 8, (Wallis). A rare species.

1376. *Hydroporus oblongus* Steph. Winnipeg, April 13, (Wallis). I have never seen this species in any collection but my own, (C.H.R.).

1396. *Coptotomus interrogatus* Fab. Winnipeg Beach, Sept. 6, (Wallis).

1399. *Ilybiosoma bifarius* Kirby. Winnipeg, April 13, (Wallis).

1423. *Agabus semipunctatus* Kirby. Winnipeg, April 12, (Wallis).

Agabus æneolus Cr. Winnipeg, April 13, (Wallis).

1434. *Agabus subfuscatus* Sharp. Winnipeg, May 13, (Wallis).

1450. *Agabus clavatus* Lec. Winnipeg, May 1, (Wallis); Aweme, Man., (Criddle). A rare species.

1466. *Rhantus bistriatus* Bergst. Winnipeg, Sept. 11, (Wallis).

Graphoderes perplexus Sharp. Winnipeg Beach, Sept. 6, (Wallis); Aweme, Man., (Criddle). A rare species.

1508. *Gyrinus fraternus* Coup. Winnipeg Beach, June 12, (Wallis).

1519. *Gyrinus affinis* Aube. Winnipeg Beach, June 12, (Wallis).

1529. *Gyrinus picipes* Aube. Winnipeg Beach, June 12, (Wallis).

Athetá nimia Casey. Metlakatla, B.C., (Keen).

Athetá keeni Casey. Metlakatla, (Keen).

Athetá insolens Casey. Massett, Q.C.I., (Keen).

Athetá fanatica Casey. Massett, Q.C.I., (Keen).

Athetá massettensis Casey. Massett, Q.C.I., (Keen).

Dimetrota retrusa Casey. Metlakatla, B. C., (Keen).

Sabletá canadensis Casey. Toronto, Ont.

Sabletá phrenctica Casey. Metlakatla, B.C., (Keen).

Acrotona adjuvans Casey. Ottawa, Ont., (Harrington).

2114. *Quedius ferox* Lec. Trenton, Ont. Sept. 4, 1 specimen, never took it before, (Evans).

2301. *Dianous zephyrus Casey*. Vernon, B.C., (Venables).

2618. *Tachinus nigricornis* Mann. Victoria, B.C., July 17, (Wallis).

3052. *Hippodamia folcigera* Cr. Stewart River, Y.T., (Nelles).

3709. *Epuræa truncatella* Mann. Stewart River, Y.T., (Nelles).

3848. *Peltis pippingskoeldi* Mann. Penticton, B.C., Aug. 16, (Wallis).

4150. *Cryptohypnus bicolor* Esch. Roland, Man., May 24, (Wallis).

4382. *Pityobius anguinus* Lec. St. Andrew's, N.B., July 11, (Treherne and Sanders).

4503. *Asaphes morio* Lec. Victoria, B.C., July 17, (Wallis).

4594. *Pœcilonota cyanipes* Say. Stewart River, Y.T., (Nelles).

4602. *Buprestis consularis* Gory. Stewart River, Y.T., (Nelles).

4611. *Buprestis adjecta* Lec. Peachland, B.C., Aug. 23, (Wallis).

4629. *Anthaxia deleta* Lec. Peachland, B.C., July 23, (Wallis).

4948. *Telephorus curtisii* Kirby. Vicinity of Stewart River, Y.T., (Nelles).

5271. *Hadrobregmus carinatus* Say. Stewart River, Y.T., (Nelles).

5329. *Cænocara scymnoides* Lec. Strassburg, Sask., June, 1907, from puff ball, (Willing).

5603. *Geotropes balyi* Jek. St. Paul's Island, Hudson Bay, Aug., 25, 1904, (Halkett).

Lachnosterna. Among 404 specimens of May beetles collected at Round Hill, N.S., by Miss E. Grace Sanders, from May 21 till June 15, only two species were represented, viz., *dubia* and *grandis*. The latter species was rare, only six being taken, three of these on *Cratægus*. The determinations were made by Mr. R. D. Glasgow, of the University of Illinois, Urbana, Ill. Mr. Glasgow is making a special study of the Lachnosternidæ, and would be glad to examine and return Canadian material. No specimens should be pinned without having the genitalea extruded. It is important, too, that the specimens be collected in the evening, when they are feeding, and a note of the food plant taken.

5880. *Xyloryctes satyrus* Fab. Mt. St. Hilaire, Que., May 20, (Chagnon).

5924. *Cremastochilus crinitus* Lec. Peachland, B.C., July 25, (Wallis).

6240. *Toxotus vittiger* Rand. Pincher, Alta., July 10, 1904, (Willing).

6250. *Pachyta rugipennis* Newm. Hymers, Ont., June 6, (Dawson).

6253. *Anthophylax malachiticus* Hald. Twp. Sabine, Ont., 1 specimen, June 17; I took one other about 1875 at Madoc Village; a rare species, (Evans).

6260. *Acmæops atra* Lec. Pine Creek, Alta., July 12, 1903, (Willing).

6320. *Leptura tribalteata* Lec. Peachland, B.C., Aug. 2, (Wallis).

6349. *Leptura tibialis* Lec. Peachland, B.C., Aug. 7, (Wallis).

6445. *Acanthocinus obsoletus* Oliv. Vicinity of Stewart River, Y.T., (Nelles).

6487. *Saperda puncticollis* Say. Guelph, Ont., May 18, (Zavitz); Macdonald College, Que., (Swaine).

6532. *Donacia hirticollis* Kirby. Penticton, B.C., Aug. 11 (Wallis).

6782. *Prasacuris phellandrii* L. Victoria, B.C., July 17, (Wallis).

6904. *Galeruca tuberculatá* Say, var. *punctipennis* Mann. Goldstream, B.C., on alder, Aug. 12, (J. R. Anderson). Not heretofore recorded from Canada, so far as I am aware, except that Horn in his synopsis of the genus gives it as occurring on Vancouver Island, (Evans).

6968. *Haltica evictá* Lec. Halfway Lake, Alta., on turnips and cabbages, (F. Strutton); Vernon, B.C., (Venables).

Phylotreta armoricæ Kock. Montreal, June 20, (Winn).

7257. *Asida politá* Say. Swift Current, Sask., Aug. 1901, (Willing).

7666. *Serropalpus barbatus* Schall. Cupar, Sask., June 4, 1907, (Willing).

7704. *Mycterus concolor* Lec. Peachland, B.C., Aug. 7, (Wallis).

7704a. *Mycterus flavipennis* Horn. Peachland, B.C., Aug. 7, (Wallis).

7724. *Calopus angustus* Lec. Hymers, Ont., July 22, (Dawson).

8121. *Pomphopæa sayi* Lec. Shawbridge, Que., June 4, (Winn).

8221. *Rhynchites eyanellus* Lec. Quill Lake, Sask., on willow, June 30, 1907, (Willing).

8203. *Auletes subcræuleus* Lec. Vernon, B.C., (Venables).

Apion commodus Fall. Aweme, Man., (Criddle).

8543. *Erycus puncticollis* Lec. Cupar, Sask., under chips and bark, June 4, 1907, (Willing).

8760. *Acalles porosus* Lec. Lethbridge, Alta., July 5, (Willing).

8825. *Mononychus vulpeculus* Fab. Quyon, Que., (Fyles).

9320. *Creniphilus moratus* Horn. Vernon, B.C., (Venables).

11079. *Phytobius griseomicans* Sz. Last Mountain Lake, Sask., June 5, (G. C. McBean).

DIPTERA.

(Arranged according to a catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI, No. 1,144. The numbers refer to the pages in the catalogue).

During the past year Mr. D. W. Coquillett has determined collections of diptera made in 1908 and 1909 in Manitoba, Alberta and British Columbia, by Mr. J. B. Wallis, of Winnipeg. In these collections are many species of interest, some of which are new to the Canadian list.

97. *Pachyrhina altissima* O. S. Winnipeg, Man., Aug. 23, 1908, (Wallis).

97. *Pachyrhina erythrophrys* Will. Winnipeg, July 6, 1908, (Wallis).

98. *Pachyrhina ferruginea* Fab. Winnipeg, June 19, (Wallis).

112. *Chironomus cristatus* Fab. Winnipeg, May 5, 1908, (Wallis).

126. *Theobaldia incidens* Thom. Metlakatla, B.C., emerged 1-6 Aug., (Keen).

140. *Sciophila flavohirta* Coq. Winnipeg, June 22, 1908, (Wallis).

144. *Neoglaphyroptera cincta* Coq. Winnipeg, June 22, 1908, (Wallis).

164. *Plecia heteroptera* Say. Winnipeg, Sept. 16, 1908, (Wallis).

172. *Rhyphus alternatus* Say. Treesbank, Man., June, 1908, (Wallis).

174. *Actina viridis* Say. Winnipeg, June 24, 1908, (Wallis).

200. *Tabanus affinis* Kirby. Peachland, B.C., Aug. 7, 1909, (Wallis).

200. *Tabanus ægrotus* O. S. Penticton, B.C., Aug., 1908, (Miss B. Farmer); Peachland, B.C., Aug 18, 1909, (Wallis).

217. *Atherix variegata* Walk. Winnipeg, June 19, 1908, (Wallis).

219. *Pterodontia flavipes* Gray. Callander, Ont., July 19, 1909, (H. A. Wenzel).

225. *Exoprosopa decora* Loew. Lethbridge, Alta., July 9, 1909; Westbourne, Man., Aug. 24, (Wallis).

225. *Exoprosopa caliptera* Say. Lethbridge, Alta., July 7, 1909; Westbourne, Man., Aug. 14, (Wallis).

227. *Dipalta serpentina* O. S. Peachland, B.C., July 31, 1909, (Wallis).

228. *Anthrax alternata* Say. Peachland, B.C., Aug. 6, 1909, (Wallis).

299. *Anthrax catulina* Coq. Peachland, B.C., July 21, 1909, (Wallis).

230. *Anthrax eumenes* O. S. Lethbridge, Alta., July 3, 1909; Victoria, B.C., July 15, 1909, (Wallis).

230. *Anthrax fulviana* Say. Westbourne, Man., Aug. 16, 1908, (Wallis).

232. *Anthrax lucifer* Fab. Winnipeg, Aug. 8, 1908; Westbourne, July 27, 1908, (Wallis).

233. *Anthrax mucorea* Loew. Lethbridge, Alta., July 7, 1909.

234. *Anthrax sinuosa* Wied. Westbourne, Man., Aug., 19, 26, 1908; Lethbridge, Alta, July 9, 1909; Peachland, B.C., July 21, Aug 18, 1909, (Wallis).

234. *Anthrax tegminipennis* Say. Winnipeg, July 21, 1908, (Wallis).

237. *Systœchus candidulus* Loew. Winnipeg, July 21, 1908, (Wallis).

247. *Psilocephala hæmorrhoidalis* Macq. Peachland, B.C., July 29, 1909, (Wallis).

256. *Stenopogon inquinatus* Loew. Peachland, B.C., Aug. 3, 1909, (Wallis).

259. *Cyrtopogon dasyllis* Will. Kaslo, B.C., Sept. 1, 1907, (Cockle).

259. *Cyrtopogon dasylloides* Will. Kaslo, B.C., Sept. 1, (Cockle).

260. *Cyrtopogon præpes* Will. Banff, Alta., (Sanson).

260. *Cyrtopogon rejectus* O. S. Peachland, B.C., July 24, 1909, (Wallis).

269. *Pogonosoma dorsatum* Say. Victoria, B.C., July 1908, (Miss B. Farmer).

272. *Laphria canis* Will. Ottawa, Sept. 1, (Hewitt).

274. *Proctacanthus milbertii* Macq. Peachland, B.C., Aug. 21, 1909, (Wallis).

276. *Erax aridus* Will. Peachland, B.C., Aug. 7, 1909, (Wallis).

281. *Tolmerus callidus* Will. Lethbridge, Alta., July 3, 1909, (Wallis).

283. *Asilus paropus* Walk. Westbourne, Man., Aug. 20, 1908, (Wallis).

300. *Dolichopus brevimanus* Loew. Winnipeg, Man., June 19, 1908, (Wallis).

349. *Pipiza albipilosa* Will. Kaslo, B.C., July 14, 1908, (Cockle).

360. *Melanostoma cærulescens* Will. Kaslo, B.C., April 12, July 10, (Cockle).

Syrphus perplexus Osburn. Kaslo, B.C., July 14, 1908, (Cockle).

368. *Syrphus umbellatarum* Fab. Kaslo, B.C., Oct. 11, 1909, (Cockle).

368. *Allograpta fracta* O.S. Winnipeg, Man., June 29, 1908, (Wallis).

375. *Rhingia nasica* Say. Winnipeg, Man., June 19, 1908, (Wallis).
375. *Hammerschmidtia ferruginea* Fallen. Winnipeg, June 19, 1908, (Wallis).
387. *Eristalis occidentalis* Will. Victoria, B.C., July 17, 1909, (Wallis).
401. *Brachypalpus pulcher* Will. Kaslo, B.C., July 21, 1907, (Cockle).
402. *Criorhina kincaidi* Coq. Kaslo, B.C., May 2, 1904, (Cockle).
408. *Physocephala burgessi* Will. Victoria, B.C., July 17, 1909, (Wallis).
456. *Exorista cheloniæ* Rond. Reared at Ottawa from larva of *Phragmatobia assimilans,* var. *franconia,* from Mr. H. Dawson, of Hymers, Ont., (Gibson).
464. *Frontina setipes* Coq. Aweme, Man., April 21, 1908, (Wallis).
582. *Palloptera jucunda* Loew. Kaslo, B.C., Oct. 27, 1906, (Cockle).
590. *Tritoxa cuneata* Loew. Lethbridge, Alta., July 4, 1909, (Wallis).
615. *Micropeza producta* Walk. Winnipeg, Man., July 6, 1908, (Wallis).
638. *Oscinis decipiens* Loew. Kaslo, B.C., Sept. 1, 1907 (Cockle).

HYMENOPTERA.

In the Entomological Records for 1907 and 1908, records are given of some Bombi. Since, Dr. H. J. Franklin has determined further material for Canadian collectors, and among these the following species may well be recorded here:

Bombus flavifrons Cresson. Metlakatla, B.C., May, (Keen).
Bombus melanopygus Mylander. Metlakatla, B.C., May, (Keen).
Bombus huntii Greene. Regina, Sask., Sept 17, Oct 3, (Willing).
Bombus terricola Kirby. Hampton, P.E.I., Aug 20, 1909, (Gibson).
Bombus rufocinctus Cresson. Gull Lake, Alta., Aug. 30, 1908 (Halkett).
Psithyrus ashtoni Cresson. Hampton, P.E.I., Aug. 20, 1909, (Gibson).
Psithyrus laboriosus Fab. Hampton, P.E.I., Aug. 20, 1909, (Gibson).

Prof. T. D. A. Cockerell, one of the leading authorities on North American bees very kindly named a small collection from the Northwest. Some of these are extremely interesting and new to Canada. The following may be mentioned:

Melissodes confusa Cr. Meota, Sask., July 8, 1906; Prince Albert, Sask., July 28, 1907; Radisson, Sask., July 29, 1907; Macleod, Alta., July 8, 1904, (Willing).
Osmia novomexicana Ckll. Medicine Hat, Alta., May 30, 1904, (Willing).
Halictoides maurus Cr. Kinistino, Sask., July 26, 1907, (Willing).
Anthidium tenuifloræ Ckll. Radisson, Sask., July 29, 1907; Saskatoon, Sask., July 18, (Willing).
Megachile calogaster Ckll. Macleod, Alta., July 2, 1904, (Willing).
Megachile infragilis Cr. Regina, Sask., July 11, 1909, (Willing).
Megachile manifesta Cr. Davidson, Sask., Aug. 21, 1907, (Willing).
Megachile pugnata Say. Radisson, Sask., July 29, (Willing).
Cœlioxys ribis Ckll. Prince Albert, Sask., July 27, 1907, (Willing).
Andrena cockerelli Graen. Lipton, Sask., June 5, 1907, (Willing).
Halictus trizonatus Cr. Mortlach, Sask., May 31, 1909, (Willing).
Halictus lerouxii ruborum Ckll. Mortlach, Sask., May 31, 1909, (Willing).
Agapostemon texanus Cr. Mortlach, Sask., May 31, 1909, (Willing).
Colletes salicicola geranii Ckll. Pincher, Alta., July 10, 1904, (Willing).

Coleocentrus pettitii Cr. Hymers, Ont., June 22, (Dawson).

Arotes amoenus Cr. Hymers, Ont., June 21, (Dawson).

Xylonomus stigmapterus Say. Hymers, Ont., (Dawson).

Echthrus niger Cr. Hymers, Ont., June 9, (Dawson).

Echthrus rufopedibus Harrington. Hymers, Ont., June 26, (Dawson).

Telenomus dalmanii (Ratz) Mayr. Reared in Division of Entomology, Ottawa, from eggs of *Notolophus antiqua,* from Little Bras d'Or, Cape Breton, N. S. Mr. Crawford, who determined the species says: "It is a European species recorded there from the same host, but not previously recorded from America."

Pachycrepoideus dubius Ashm. Reared in Division of Entomology, Ottawa, from breeding jar containing puparia of Cabbage Root Maggot; emerged Aug 14.

Nasonia tortricis Brues. Baskatong, Que., emerged from pupæ of *Tortrix fumiferana,* Aug. 1909, (Gibson).

Mematus pinguidorsum Dyar. Ottawa, larva Sept. 16, (Gibson).

Pteronus ochreatus Rohwer. St. John, N.B., July 14, (Leavitt).

Pontania pumila Rohwer. St. John, N.B., July 14; Nerepis, N.B., July 22, (Leavitt).

Pontania leavitti Rohwer. Nerepis, N.B., July 11, (Leavitt).

Pristiphora idiotiformis Rohwer. Nerepis, N.B., Aug. 18; St. John, N.B., Sept. 1, (Leavitt).

Pristiphora pallicoxa Rohwer. Nerepis, N.B., July 22, (Leavitt).

Cryptocampus pallistigmus Rohwer. St. John, N.B., July 18, (Leavitt).

Polybates secundus Rohwer. St. John, N.B., Sept. 1, (Leavitt).

Parabates leucostomus Rohwer. St. John, N,B., July 11, (Leavitt).

Hemitaxonus rufopectus Rohwer. Nerepis, N.B., Aug. 22, (Leavitt).

Monsoma maura Rohwer. Nerepis, N.B., July 18; St. Johns Bay, N.B., July 14, (Leavitt).

Dimorphopteryx melanognathus Rohwer. Nerepis, N.B., July 22, (Leavitt).

Tenthredo diversiceps Rohwer. Nerepis, N.B., July 22, (Leavitt).

HEMIPTERA.

Little systematic work has been done in this order, as far as the writer knows, in Canada, during 1910. Small collections of material gathered in other years have been worked over by Mr. Van Duzee, and of these the following species are of interest. They are entered here in the order in which they were received.

Apiomerus ventralis Say. Lethbridge, Alta., July 3, 1909, (Wallis).

Aradus inornatus Uhler. Peachland, B.C., Aug. 17, 1909, (Wallis).

Aradus robustus Uhler. "North West Territories," (record sent by Mr. Evans).

Lygus viticollis Reut. Winnipeg, Man., June 29, 1908, (Wallis).

Corythuca arcuata Say. Chelsea, Que., June 20, (Groh).

Alydus conspersus Mont. Aylmer, Que., (Fyles).

Megalotomus quinquespinosus Say. Aylmer, Que., (Fyles).

Podisus placidus Uhler. Co. Hastings, Ont., (Evans).

Podisus sereiventris Uhler. Co. Hastings, Ont., Aug. 15, 1906, (Evans).

Peribalus piceus Dallas. Sudbury, Ont., June 13, 1889, (Evans).

Crophius bohemani Stal. "North West Territories," (record sent by Mr. Evans).

Peritrechus fraternus Uhler. Belleville, Ont., (Evans).

Pilophorus walshii Uhler. Belleville, Ont., (Evans).

Plinthisus americanus Van D. Belleville, Ont., (Evans).

Antillocoris pallidus Uhler. Belleville, Ont., (Evans).

Banasa calva Say. Trenton, Ont., Sept. 21, 1901, (Evans).

Phimodera torpida Walk. "North West Territories," (record sent by Mr. Evans).

Thyreocoris montanus Van D. "British Columbia, June 10-20, 1905," (record sent by Mr. Evans).

Aelia americana Dallas. "North West Territories," (record sent by Mr. Evans). A rare form.

Zicrona cærulea Linn. Sudbury, Ont., (Evans).

Sciocoris microphthalmus Flor. Sudbury, Ont., 1886; Belleville, Ont., (Evans). When determining these Mr. Van Duzee remarked: "The only specimens from America which I have seen of this species, excepting one taken by Mrs. Slosson in the White Mountains."

Okanagana novæboracensis Emmons. Sudbury, Ont., 1892, (Evans).

ORTHOPTERA.

Dr. E. M. Walker has kindly sent me the notes on the species mentioned below, all of which he thinks are worthy of including here. His papers on "The Orthoptera of Western Canada," which have recently appeared in the *Canadian Entomologist* will undoubtedly lead to much greater attention being paid to these insects by collectors in the West.

Pycnoscelus surinamensis Scudd. One immature specimen.

Periplaneta australasiæ Brunn. Several immature specimens.

Nyctobora sericea Scudd. One mature specimen.

Panchlora virescens Sauss. Two mature specimens.

The above four species were found upon bunches of bananas, at Toronto, by Mr. C. W. Nash.

Chlöealtes conspersa Harris. Aweme, Man., July 22, 1910, 3 males, (Criddle). This species has been only once before reported from Manitoba, by Scudder, in 1862, (E. M. W.).

Melanoplus angustipennis coccineipes Scudd. Fort William, Ont., Aug. 2, 1910, pair in copula, (Walker).

Nemobius fasciatus abortivus Caudell. Fort William, Ont., Aug. 9, 1910, (Walker).

ODONATA.

Dr. E. M. Walker, of Toronto, has examined, during the year, much material collected in different parts of Canada. Some of the specimens sent to him are of considerable interest. He has, therefore, been good enough to send me for inclusion here, the following records:

Lestes congener Hagen. Peachland, B.C., Aug. 9, 1909, 1 male, 1 female, (Wallis).

Lestes disjunctus Selys. Peachland, B.C., Aug. 9, 1909, 1 male, 1 female, (Wallis).

Nehalennia irene Hagen. Aweme, Man., July 4, 1909, 1 female (Criddle); Winnipeg Beach, Lake Winnipeg, Man., June 19, 1909, 3 males, 4 females, (Wallis).

Enallagma cyathigerum (Charp.). Nepigon, Ont., Aug. 8, (Walker); Lethbridge, Alta., July 5-9, 1909, (Wallis); Peachland, B.C., July 24, 1909, (Wallis).

Enallagma calverti Morse. Nepigon, Ont., Aug. 8, 1910, (Walker); Aweme, Man., July 1-24, 1909, (Criddle); Winnipeg Beach, Man., June 19, 1909, (Wallis).

Ischnura verticalis (Say). Nepigon, Ont., Aug. 8, 1910, (Walker). This appears to be the most northern record for this species, and the most westerly in Canada, (E. M. W.).

Ophiogomphus severus Hagen. Lethbridge, Sask., July 8, 1909, 1 male, (Wallis). First Canadian record, (E. M. W.).

Ophiogomphus colubrinus Selys. Nepigon, Ont., Aug. 6, 1 male, 1 female, (Walker). First Ontario record, (E. M. W.).

Gomphus olivaceus Selys. Peachland, B.C., Aug. 12, 1909, 1 female. First Canadian record, (E. M. W.).

The last three species were determined by comparison with specimens in the Hagen collection, Museum of Comparative Zoology, Cambridge, Mass., (E. M. W.).

Aeshna sitchensis Hagen. Ellis Bay, Anticosti Island, Sept., 12, 1 female, (E. V. Cowdry).

Aeshna umbrosa Walk. Ellis Bay, Anticosti Island, Sept. 12, common, (E. V. Cowdry); Winnipeg Beach, Man., Sept. 6, 1909, (Wallis).

Tetragoneuria canis Maclachlan. DeGrassi Pt., Lake Simcoe, Ont., June 24, 2 males, (Walker); Sudbury, Ont., June 11, 1892; June 6, 1893, 2 males, (Evans); Hull, Que., 1 male, (Fyles).

Cordulia shurtleiffi Scudd. Sudbury, Ont., June 26, 1892, 2 males, (Evans).

Somatochlora walshii (Scudd). De Grassi Pt., Lake Simcoe, Ont., July 2, 1 male, (Walker).

Somatochlora albicincta (Burm.). Aweme, Man., June 11, 1909, 1 female, (Criddle).

Libellula pulchella Drury. Fort William, Ont., Aug. 3, 1 specimen seen, (Walker). This is the most northern record for this species, (E. M. W.).

Leucorrhinia frigida Hagen. Sudbury, Ont., June 26, 1892, 1 male, 2 females, (Evans).

Leucorrhinia hudsonica (Selys). Sudbury, Ont., June 11, 1893, 1 female, (Evans).

Leucorrhinia borealis Hagen. Bird's Hill, Man., June 5, 1909, (Wallis).

SIPHONAPTERA.

Several hundreds of specimens of fleas were collected by the Rev. J. H. Keen, of Metlakatla, B.C. These were submitted to the Hon. N. Charles Rothschild, who has determined the following species:

Ceratophyllus agilis. Specimens taken from Neotoma.
Ceratophyllus ciliatus. Specimens taken from Sciurus.
Ceratophyllus gallinæ.
Ceratophyllus charlottensis?
Ceratophyllus fasciatus.
Hystrichopsylla dippiei.

FINANCIAL STATEMENT

For the Year ending October, 1910.

Receipts.

Balance from 1909	$373 06
Members' Fees	350 48
Reports and Back Numbers	199 07
Advertising	68 22
Government Grant	1,000 00
Printing	71 68
Cork and Pins	103 02
Expense	20 00
Interest	13 89
	$2,199 42

Expenditures.

Subscription (Fletcher Memorial)	$50 00
Annual Report	123 50
Cork and Pins	76 95
Salaries	75 00
Expense, Postage, Etc.	87 77
Insurance	26 00
Annual Meeting	43 25
Printing	1,002 90
Library	29 86
Bank Exchange	4 23
	$1,469 46
Balance	729 96
	$2,199 42

J. E. HOWITT, *Treasurer.*

Examined and found correct.

S. B. MCCREADY,
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INDEX.

PAGE.
Acarina attacking basswood 100
Aleyrodes forbesii 78
“ vaporariorum 78
Aleyrodicus asarumis 78
Aleyrodidæ of Ontario 78
Anisota rubicunda 29
Anthonomus quadrigibbus 94
Aphelinæ, host relations of 74
Aphid, pine bark 15
Aphids of the orchard 23
Apple aphis, permanent 94
“ “ woolly 20, 88
“ cigar case-bearer 94
“ curculio 94
“ maggot 17, 36, 94
“ tent-caterpillar 94
“ worm .... 6 (Plate A), 21
Argynnis myrina, melanic form of. 30
Argyresthia thuiella 14
Asparagus beetles 17

Banks' Catalogue of Nearctic Spiders 102
Basilona imperialis 31
Basswood Insects 99
Bean maggot 56
Beetles found about foliage 45
Beutenmuller's Neuroterus and their galls 102
Black aphis 23
Blackberry leaf-miner 25
Blatchley's Coleoptera of Indiana.. 102
Blister-beetles found on foliage.... 47
Blister-beetle, western 27
Blister mite 23
Brown-tail moth 28
Bucculatrix canadensisella 15
Bud moth 15, 92
Buffalo tree-hopper 92
Buprestid beetles, leaf-eating 49
Butternut Tingis 15

Cabbage aphis 26
Cæsar, Lawson, article by 21
Camponotus pennsylvanicus 30
Cankerworm, Fall 15
Cankerworms 15, 18, 19, 95
Cantharis nuttalli 27
Carpocapsa pomonella 19, 21, 94
Carpet beetles 18
Casey's Memoirs on the Coleoptera, I. 103
Ceresa bubalus 92
Chermes abietis, galls on spruce.. 7 (Plate B)
Chermes, galls on spruce 26
“ pinicorticis 15
“ similis, galls on spruce... 7 (Plate B)
“ strobilobius 14
Cherry and pear slug 13
“ fruit fly .... 8 (Plate A), 24
Chrysobothris femorata 92
Clothes moth, southern 16
Chrysomelid beetles 51
Clover root-borer 12, 97
“ weevil, green 12

PAGE.
Coccidae, bibliography of 76
“ enemies of 73
“ gall making 64
“ of Canada 64
Coccinae of Canada 69
Codling moth 19, 21, 94
Coleophora fletcherella 92
“ laricella 14
Coleoptera, captures of 113
“ of Indiana, Blatchley's. 102
Conotrachelus nenuphar 19, 21, 94
Coquillett's Type Species of Diptera 103
Corn-seed maggot 12
Corythuca arcuata 13
Criddle, Norman, article by....... 60
Cucumber beetle 99
Currant aphis 20, 96
“ borer 95
“ sawfly 96
“ spanworm 95
Cutworm, red-backed 27
Cutworms 12, 27
Dactylopiinæ of Canada 68
Dendroctonus simplex..81, 82 (Fig. 4, 5), 91 (Fig. 18)
Diaspinæ of Canada 71
Dietz's Blastobasidæ of North America 103
Diptera, captures of 115
Dragonflies 56
Dryocœtes autographus..84, 88 (Fig. 14), 91 (Fig. 17)

Eccoptogaster rugulosus 24, 92
Emphytus cinctipes 16
Empoasca mali 13
Enarmonia prunivora 21
Encyrtinæ, host relations of 75
Eriocampa cerasi 20
Eriocampoides limacina 24
Eriophyes pyri 23
Eucosma scudderiana 30
Eye-spotted bud-moth 13, 92, 98

Fall webworm 13, 98
Fidia viticida 98
Field crops, insects attacking 12
Financial Statement 121
Flat-headed borer 92
Flea-beetle, hop 27
“ “ horse-radish 59
“ “ turnip 12
Forest and shade trees, insects attacking 13
Fruit bark-beetles 24
Fruit trees, insects attacking 18
Fyles, Rev. T. W., articles by ...30, 40, 51

Gibson, A., articles by 11, 99, 101
Gnathotrichus materiarius .. 85 (Fig. 7)
Grant, C. E., article by 18
Grape-vine root-borer 96
Grasshoppers 98
Greenhouse and flower-gardens, insects of 15

PAGE
Greenhouse leaf-tyer 15
Grossbeck's Geometrid Moths of the genus Pero 103

Hamilton, R. S., article by 18
Hampson's Catalogue of British Museum Phalænæ 103
Hemiptera, attacking basswood 100
" captures of 116
" on the milk vetch 31
Hessian fly 12
Hewitt, C. G., articles by 27, 62
Homoptera, attacking basswood...99, 101
Hop flea-beetle 27
Household insects 16
Howitt, J. E., article by 58
Hygrotrechus remigis 58
Hylastinus obscurus ..12, 97 (Fig. 20) 98 (Figs. 21, 23)
Hymenoptera attacking basswood .. 100
" captures of 119
Hyphantria textor 13

Insect notes from Ste. Anne's 88
Insects, basswood or linden 99
" of the larch 81
" role of, in water-life 42
Ips balsameus ...84, (Fig. 6), 89 (Figs. 9-12), 90 (Fig. 16)
" caelatus ....84, 89 (Fig 13)

Jarvis, T. D., articles by 64, 78
Johannsen's Mycetophilidæ of North America 104

Kirby's Catalogue of British Museum Orthoptera 104
Lady-beetles 16
Larch saw-fly 14, 62, 99
Leaf-bug, four-lined 16
Leaf-hopper, grape-vine 16
Lepidoptera attacking basswood... 100
" captures of 106
Lepidosaphes ulmi 14, 23, 94
Linden, insects of 99
Locusts, migration of native 60
Lygus pratensis 15
Lyman, H. H., article by 34
Malacosoma americana 94
Maple Phenacoccus 14
" worm, green-striped 29
Merodon equestris 28
Meromyza americana 12
Metallus (Scolioneura) rubi 25
Monomychus vulpeculus 30
Monophadnoides rubi 25
Morris, F. J. A., articles by 16, 46
Muttkowsky's Catalogue of North American Odonata 104
Mycetophilidæ of North America, Johannsen's 104
Myzus cerasi 23
" ribis 20

Narcissus fly 28
Nectarophora destructor 26
" pisi 16

PAGE.
Needham, J. G., article by 42
Nematus erichsonii 62
Newts 52

Obera bimaculata 18, 96
" tripunctata 92
Odonata, captures of 121
" Muttkowsky's Catalogue of 104
Occanthus niveus 20
Orchestes rufipes 15
Orthezíinæ of Canada 68
Orthoptera, captures of 119
" Kirby's Catalogue of ... 104
Otiorhynchus sulcatus 99
Oyster-shell scale 18, 23, 94

Paragrotis ochrogaster 27
Parasitic insects, practical importance of 62
'Pea aphis,' destructive.............16, 26
Pear and cherry slug 24
Pear Psylla 24
Pear tree slug 20
Pegomya fusciceps 58
Pelopæus cementarius 32
Phenacoccus acericola 14
Phleotribus liminaris 24, 92
Phlyctænia ferrugalis 15
Phyllotreta armoraciæ 59
" vittata 12, 60
Phytonomus nigrirostris 12
Pierce's Monograph of the Strepsiptera 104
Pigeon tremex 18
Plant lice 15
Plum curculio 19, 21, 94
Pœcilocapsus lineatus 16
Polygraphus rufipennis 83
Potato-beetle 27
Psila rosæ 96
Psylliodes punctulata 27

Raspberry cane-borer 96
" saw-fly 25
Rhagoletis cingulata 24
" pomonella 17, 22
Rohwer's Tenthredinoidea from Eastern Canada 104
Root maggots 12, 26
Rose worm, curled 16
Round-headed borer 88
Rust fly 96
San José scale 22, 23
Saperda candida 88
Scarabæid beetles, leaf-eating 48

Schizoneura lanigera 20, 23, 88
Scolytid beetles of the larch 81
Selandria cerasi 17
Sesia tipuliformis 95
Shot-hole borer 20
Siphonaptera, captures of 120
Skeletonizer, birch-leaf 15
Small fruits, insects attacking 96
Smith's List of New Jersey Insects.. 106
Snodgrass's Thorax of the Hymenoptera 105

PAGE.
Spiders, Bank's Catalogue of 102
Spruce bud-worm 14, 29, 99
" galls 25, 26
Strepsiptera, Pierce's Monograph of 104
Swaine, J. M., articles by 81, 88

Tarnished plant-bug 15
Tent caterpillar, American 94
" " forest 29
Tenthredinoidea from Eastern Canada, Rohwer's 104
Tetrastichus gelechiæ 30
Tineola biselliella 18
Tmetocera ocellana ..13, 92, 93 (Fig. 19)
Tortrix fumiferana 14, 29
Tree cricket, snowy 20
Treherne, R. C., article by 19
Tremex columba 18

PAGE.
Turnip flea-beetle 12
Tussock moth 19, 29

Wasps, frequenting pool 54
Water beetles 54
" snails .... 53 (Fig. 2)
" strider 53
Wheat-stem maggot 12
Wheeler's Ants 106
White cedar twig-borer 14
White grubs 12, 25
Williams, J. B., article by 19
Williamson's North American Species of Macromia 105
Winn, A. F., article by 59
Wireworms 12, 25
Woolly aphis 20
Woolly larch aphid 14

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